

UNITED STATES OF AMERICA:
WAR DEPARTMENT.

MONTHLY WEATHER REVIEW.

(GENERAL WEATHER SERVICE OF THE UNITED STATES.)

OCTOBER, 1885.

PREPARED UNDER THE DIRECTION OF
BRIG. & BVT. MAJ. GEN'L W. B. HAZEN,
CHIEF SIGNAL OFFICER OF THE ARMY,

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List of merchant marine steam and sailing vessels from which International Simultaneous Meteorological reports were received at the Office of the Chief Signal Officer, U. S. Army, Washington, D. C., in time to be used in the preparation of the Weather Review for the month of October, 1885.

Name of vessel.	Observers.	Name of vessel.	Observers.	Name of vessel.	Observers.
Allan Line.		Monarch Line.		Wilson Line.	
Br. s. s. Circassian.....	Capt. Wm. Richardson.	Br. s. s. Assyrian Monarch.....	Capt. John Harrison.	Br. s. s. Bassano.....	Capt. T. J. Moore.
Grecian.....	C. E. LeGallais.	Grecian Monarch.....	B. J. W. Bristow.	Chicago.....	J. W. Jones.
Manitoba.....	R. Cartuthers.	Lydan Monarch.....	Thos. C. Huggett.	Galileo.....	Richard Potter.
Prussiana.....	A. McDougall.			Lepanto.....	B. H. Rogers.
Scandinavian.....	John Park.			Otranto.....	F. Kerr.
Siberian.....	B. P. Moore.			Salerno.....	Wm. Abbott.
American Line.				Wells, Ward Line.	
Br. s. s. British Prince.....	Samuel Nowell.			Br. s. s. Richmond.....	Jacob Garson.
British Princess.....	E. H. Frost.			Miscellaneous.	
Indiana.....	B. W. Sargent.			Br. s. s. Bedford.....	Thos. Aikenhead.
Lord Clive.....	P. Urquhart.			Ger. s. s. Brutus.....	J. A. Voegel.
Lord Gough.....	E. M. Hughes.			Br. s. s. Camden.....	S. R. Chandler.
Anchor Line.				Cranebrook.....	John W. Harvey.
Br. s. s. Anchoria.....	J. J. Small.			Dago.....	W. H. Bisset.
Australis.....	Alex. McRitchie.			Edith Golden.....	John H. Bennett.
Circassia.....	A. Campbell.			El Callao.....	Thos. Robertson.
City of Rome.....	R. D. Munro.			Elstow.....	John J. McEgan.
Columbia.....	B. Th. Garvie.			Joseph Perous.....	Warren F. Wiley.
Devonia.....	Hugh Young.			Lorenzo D. Baker.....	Wm. Th. Irving.
Trinacria.....	Geo. Mitchell.			Monte Rosa.....	S. de Aldercoen.
Arcos Line.				Navarro.....	P. Verriere.
Br. s. s. Critic.....	W. E. Lord.			Neustris.....	Benj. Davies.
Atlas Line.				Phoenix.....	W. H. Thomas.
Br. s. s. Albia.....	J. W. Sisson.			Pomona.....	John Jenken.
Albano.....	H. H. Hughes.			Reconic.....	J. Visbeck.
Alvo.....	David Williams.			Roman.....	David Williams.
Andes.....	D. de Amérigo.			Sulina.....	Thos. Potter.
Br. s. s. Cherish.....	T. M. McKnight.			Valencia.....	Ch. Off. Ant. Estopha.
Booth's S. S. Co. (Holland).				Vertumnus.....	Capt. John Legue.
Br. s. s. Clement.....	Thomas Burley.			"New York Herald Weather Service."	
Cyclid.....	J. H. Johnson.			Br. s. s. Acapulco.....	W. G. Blackford.
Brooklyn City Line.				Adriatic.....	H. Parsell.
Br. s. s. Brooklyn City.....	W. Pitt.			Advance.....	Jas. R. Beers.
Linden City.....	T. H. Gore.			Alba.....	J. W. Sanson.
Wells City.....	T. L. Weiss.			Alaska.....	Geo. S. Murray.
Canada Shipping Co.				Albano.....	H. H. Hughes.
Br. s. s. Lake Superior.....	M. L. Tranmar.			Alvo.....	E. J. Seider.
Cromwell Line.				Arizona.....	D. Williams.
Am. s. s. Louisiana.....	E. N. Gager.			Aurania.....	Sam. Brooks.
Hudson.....	H. R. Freeman.			Baltic.....	W. H. F. Hains.
Canard Line.				Belgianland.....	Robt. E. Bence.
Br. s. s. Acuria.....	W. H. P. Hains.			Britannic.....	W. A. Brydon.
Catalonia.....	Alex. McKay.			Bothnia.....	Thos. Roberts.
Cephalonia.....	Henry Walker.			Britannic.....	H. Perry.
Eurula.....	T. Cook.			Calcutta.....	Benj. Glendell.
Gallia.....	M. Murphy.			Chalmers.....	Robt. B. Quick.
Pavonia.....	B. Woodford.			City of Alexandria.....	J. W. Reynolds.
Seythia.....	P. Whelan.			City of Berlin.....	Francis S. Land.
Serbia.....	W. McKean.			City of Chicago.....	Fred Watkins.
Edmond & Co's S. S. Line.				City of Chester.....	H. Condron.
Ger. s. s. Australia.....	G. Franck.			City of Puebla.....	John Deaken.
Karupa.....	L. A. Kossal.			City of Richmond.....	A. W. Lewis.
Polynesia.....	A. Kuhn.			Charibel.....	T. M. McKnight.
Fernox Line.				Colon.....	Chas. C. Lima.
Br. s. s. Albania.....	W. Malloney.			Crescent City.....	Jas. L. Lockwood.
Durham City.....	M. P. Lund.			Elder.....	H. Helmers.
Stockholm City.....	K. Doyle.			Elysia.....	James Brown.
General Trans-Atlantic Steamship Co.				Ena.....	W. Willigerod.
Fr. s. s. Amérigo.....	E. Santelli.			Etruria.....	T. Cook.
Canada.....	G. de Kerabloc.			Gallia.....	M. Murphy.
Germania.....	M. de Jouselin.			Gleiss.....	F. V. Schierbeck.
Labrador.....	P. d'Hauterive.			Leasing.....	B. Voss.
St. Laurent.....	M. de Jouselin.			P. Caland.....	T. H. Bonjer.
Great Western S. S. Line.				Pennland.....	R. Weyer.
Br. s. s. Dorset.....	Ch. Off. Wm. H. Bates.			Republic.....	P. J. Irving.
Warwick.....	Capt. P. F. Lobbett.			Rhyndland.....	J. C. Jamison.
Gulf Line.				San Marcos.....	Ch. Off. A. B. Connor.
Br. s. s. Abyssinia.....	J. Price, R. N. R.			Saratoga.....	Capt. John McIntosh.
Arizona.....	J. Price, R. N. R.			Schedam.....	G. Bakker.
Nevada.....	John Douglas.			Servia.....	W. McMickan.
Wisconsin.....	Edward Bentley.			St. Laurent.....	M. de Jouselin.
Wyoming.....	C. L. Rigby.			State of Georgia.....	Geo. Moodie.
Hamburg-American Line.				Switzerland.....	H. Buschmann.
Ger. s. s. Bohemia.....	R. Karlowa.			W. A. Scholten.....	G. J. Via.
Friska.....	E. Kopf.			Waeland.....	J. Ueberweg.
Hammonia.....	H. F. Schwensen.			Westernland.....	Com. W. G. Bantle.
Leasing.....	B. Voss.			Wiconsin.....	Capt. Edw. Bentley.
Moravia.....	O. Penoldt.			Wyoming.....	Chas. L. Rigby.
Rhodia.....	H. Vogel-sang.			Zaandam.....	A. Potjer.
Rugia.....	A. Albers.			Sailing vessels.	
Suevia.....	C. Ludwig.			Am. s. s. Abbie H. Green.....	W. W. Gheen.
Wieland.....	C. Hebach.			Am. s. s. Albenarle.....	W. H. Forbes.
Westphalia.....	H. Barends.			Am. s. s. Arcot.....	J. W. Gotes.
Imora Line.				Br. s. s. Antonia Sala.....	F. H. Mitchell.
Br. s. s. City of Berlin.....	Francis S. Land.			Ger. s. s. Betty.....	S. Wohlmut.
City of Chicago.....	Fred Watkins.			Br. s. s. Childwall.....	Thos. O. Watson.
City of Richmond.....	A. W. Lewis.			Br. s. s. Charles S. Whitney.....	Geo. D. Spicer.
Johanna Line.				Br. s. s. Doctor Lasker.....	H. Buschmann.
Br. s. s. Nessmou.....	John Inch.			Br. s. s. E. J. Spicer.....	Dewis Spicer.
Leopold & Holt's Steamship Company.				Am. s. s. Etie H. Lister.....	Smith D. Mason.
Br. s. s. Author.....	Robert Buddie.			Br. s. s. Exile.....	Geo. J. Pearce.
Bessel.....	Chas. J. Watson.			bgt. George.....	W. H. Champlin.
Biele.....	Fred Graham.			Am. s. s. Governor Hall.....	E. G. Coffin.
Dalton.....	J. Russell.			Am. s. s. Grindloven.....	John Cain, Jr.
Eucled.....	Alex. W. Pym.			Ger. s. s. Heinrich & Tonio.....	O. G. Ellingsen.
Hevelius.....	John Carroll.			Br. s. s. Harry and Aubrey.....	L. Meyer.
Belg. s. s. Hipparchus.....	Wm. Kelly.			Am. s. s. Idaho.....	J. N. Tedford.
Br. s. s. Lussell.....	Robt. Graham.			Br. s. s. Iolanthe.....	W. S. Richardson.
Olbers.....	James Clarke.			Am. s. s. Lucy A. Nichols.....	Geo. Scott.
Plato.....	John P. Bevis.			Am. s. s. Maggie Abbott.....	1st mate Wm. Oates.
Ptolemy.....	W. P. Ballantine.			Br. s. s. Mary Fluk.....	Capt. D. C. McIntosh.
Lepant Line.				Br. s. s. Mistetoe.....	Daniel B. Darrak.
Br. s. s. Venetian.....	W. H. Tran.			Am. s. s. Nelson Barthtt.....	Israel L. Delap.
Virginian.....	M. Pitt.			Ger. s. s. Palms.....	Samuel Watts.
Mallory Line.				Am. s. s. Raxon.....	William Bahls.
Am. s. s. Alamo.....	Sam. Risk.			Am. s. s. Sarah D. J. Rawson.....	M. Nash.
Colorado.....	Jas. Daniels.			Br. s. s. Sallum.....	Thos. P. French.
Lampasa.....	M. D. Crowell.			Br. s. s. Strathmair.....	Alex. Wilson.
Rio Grande.....	Jas. F. Lewis.			Am. s. s. Templar.....	R. W. Fleming.
San Marcos.....	A. C. Butrows.			Ger. s. s. Union.....	R. Roberts.
Mediterranean & New York Steamship Co.				Ger. s. s. Western Chief.....	H. Fokken.
Br. s. s. Pocon.....	William Bowen.			Br. s. s. Winnifred.....	Fr. Sander.
Mis. & Dominion S. S. Co.					N. P. Dutton.
Br. s. s. Ontario.....	W. P. Couch.				R. McDonald.
Toronto.....	Jas. McAuley.				

MONTHLY WEATHER REVIEW.

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INTRODUCTION.

This REVIEW contains a general summary of the meteorological conditions which prevailed over the United States and Canada during October, 1885, based upon the reports from the regular and voluntary observers of the Signal Service and from co-operating state weather services.

Descriptions of the storms which occurred over the north Atlantic Ocean during the month are also given, and their approximate paths shown on chart i.

The number of areas of low pressure charted during the month is eight, the average for October for the last twelve years being 10.7. That described as number iv was the severest storm of the month, and during its passage from near Key West, Florida, to the Gulf of Saint Lawrence, from the 10th to 15th, caused dangerous gales and very high tides at the coast stations.

The mean temperature was below the normal by from 1° to 7° in the districts east of the Rocky Mountains, except in northern New England, where it was slightly above the normal. In the Rocky Mountain districts and on the Pacific coast the month was warmer than the average, the departures from the normal temperature being nearly as marked as those for districts to the eastward, as mentioned above.

The precipitation was above the average in the lower Missouri valley and over the greater part of the country to the eastward of the Mississippi River; it was below the average in the upper lake region, east Gulf states, and, except at a few stations, in all districts west of the Mississippi.

The very heavy rains of the 28th and 29th, attending the passage of the area of low pressure described as number vii, caused destructive freshets in Virginia and West Virginia.

There were but few local storms and tornadoes during the month.

Under the heading "Temperature of the air" will be found a table showing the dates of the last frosts of spring and the first frosts of autumn for the years from 1875 to 1884, inclusive.

An additional chart (number v) is published with this REVIEW; it shows the ranges of extreme temperature over the United States since the establishment of Signal Service stations, *i. e.*, the difference between the highest and lowest observed temperature during the period of observations.

In the preparation of this REVIEW the following data, received up to November 20, 1885, have been used, *viz.*, the regular tri-daily weather-charts, containing data of simultaneous observations taken at one hundred and thirty-three Signal Service stations and seventeen Canadian stations, as telegraphed to this office; one hundred and seventy-seven monthly journals and one hundred and sixty-six monthly means from the former, and seventeen monthly means from the latter; two hundred and eighty monthly registers from voluntary observ-

ers; forty-five monthly registers from United States Army post surgeons; marine records; international simultaneous observations; marine reports through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs, furnished by the publishers of "The New York Maritime Register;" monthly weather reports from the New England Meteorological Society, and from the local weather services of Alabama, Georgia, Indiana, Minnesota, Missouri, Nebraska, Ohio, and Tennessee, and of the Central Pacific Railway Company; trustworthy newspaper extracts, and special reports.

Referring to the use of the terms "cyclones," "areas of low pressure," "tornadoes," etc., the following brief definitions have been recommended for general use in this REVIEW:

It is advised that the terms "areas of high pressure" and "areas of low pressure" be used in publications describing the location of either feeble or decided minimum or maximum atmospheric pressure, but upon the occurrence of distinct cyclones, as defined below, the term "cyclone" will be used in descriptions.

A cyclone is a large, gyratory storm, generally from 500 to 1,000 miles, or more, in diameter, with a considerable area of low pressure in the interior.

A tornado consists of a very small and violent gyration of air, generally much less than a mile in diameter, with a rapidly ascending current in the centre, and a low barometric pressure very near the centre where there is generally too much violence of agitation for it to be observed, and it is specially marked by a characteristic funnel-shaped cloud with a progressive movement.

ATMOSPHERIC PRESSURE.

[Expressed in inches and hundredths.]

The mean atmospheric pressure for October, 1885, determined from the tri-daily telegraphic observations of the Signal Service, is shown by isobarometric lines on chart ii.

The mean pressure is greatest over the central and northern Rocky Mountain districts, where the barometric means generally range between 30.1 and 30.14, the highest monthly mean, 30.14, being reported from Fort Benton, Montana. The mean pressure is least over Florida and the southern portions of Arizona and California, the barometric means ranging from 29.9 to 29.95, the lowest being 29.9, at Fort Thomas, Arizona. Eastward from the area of greatest mean pressure to the upper lake region the barometric means decrease to 29.94 (at Milwaukee, Wisconsin), and from the upper lake region eastward to New England and the Canadian Maritime Provinces the mean pressures increase to 30.07 at Yarmouth, Nova Scotia. From the south Atlantic coast to western Texas there is a gradual increase in the barometric means from 29.95 to 30.05. Along the Pacific coast the pressures increase with the latitude from 29.91 in southern California to 30.0 on the north Pacific coast.

As compared with the mean pressure for the preceding month, there has been a decrease, ranging from .01 to .08, in all districts to the eastward of the Mississippi River, with the exception of the east Gulf States, New England, and the Canadian Maritime Provinces, where there has been an increase. A decrease in the barometric means for October as compared with those for September, in the districts above named, is an abnormal feature, as the normal pressure for October averages about .05 above that for September. To the westward of the

Mississippi River the pressure in all districts is greater than for September, and over the greater part of this region the increase exceeds .10. The greatest excess is shown in the central and northern Rocky Mountain districts, where the difference between the means for the two months ranges from .15 to .23.

The departures from the normal pressure at various Signal Service stations are given in the tables of miscellaneous meteorological data, and on chart iv they are exhibited by lines connecting stations of equal departure. On the Pacific coast and to the eastward of the ninety-seventh meridian the mean pressure for October is below the normal, the departures exceeding .10 in the lower lake region, Ohio Valley, Tennessee, and in the middle and south Atlantic states; on the Pacific coast the departures below the normal vary from .01 to .05. In the plateau districts and over the eastern slope of the Rocky Mountains the pressure is above the normal, the departures ranging generally from .02 to .07.

BAROMETRIC RANGES.

The monthly barometric ranges at the various Signal Service stations are also given in the tables of miscellaneous data. They are greatest in the Middle States and least in the southern slope and southern plateau. In all districts to the westward of the Mississippi River, except in Dakota and Montana, the monthly ranges were less than .70. To the eastward of the Mississippi, except in the east Gulf states and Florida, the ranges exceeded .70. The greatest range, 1.23, occurred at Philadelphia, Pennsylvania, and the least, .26, at Fort Thomas, Arizona.

AREAS OF HIGH PRESSURE.

Five well-defined areas of high pressure passed over the United States and territories during the month of October. The first was observed in the northern Rocky Mountain regions west of the one hundred and seventh meridian, and extended westward to the north Pacific coast. The second passed southward to the west Gulf states and there disappeared. Two passed southeastward to the Ohio Valley and then northeastward, disappearing to the north of New England, and the fifth, at no time wholly within the stations of observation, passed eastward north of the Lake region, and was central in the Saint Lawrence Valley at the close of the month.

The following summary shows where these areas were first and last observed, with the dates of observations:

I.—First observed in Washington Territory, on October 1st; last observed in Alabama, on the 5th.

II.—First observed in British Columbia, on the 4th; last observed north of New England, on the 9th.

III.—First observed north of Montana, on the 7th; last observed northeast of Nova Scotia, on the 14th.

IV.—First observed in Montana, on the 17th; last observed in Louisiana, on the 22d.

V.—First observed north of Minnesota, on the 26th; last observed in the Saint Lawrence Valley, on the 31st.

The following is a detailed account of the weather conditions attending the development and movement of these areas during their transit over the United States:

I.—On the morning of the 1st an area of high pressure extended over the Rocky Mountain region, the pressure being greatest in the eastern portion of Washington Territory, where it was from .2 to .3 above the normal; it was also above the normal from the Saint Lawrence Valley westward to Washington Territory, and from .2 to .3 below the normal in the Southern States, where general rains occurred. This area moved eastward over Montana during the 2d and 3d, causing a decided fall in temperature, with light snow in Colorado, and the first killing frost at Bismarck, Dakota, on the morning of the 3d. A low area to the east increased in energy, moving southeastward to the Lake region, while the pressure increased rapidly on the east slope of the Rocky Mountains and as far south as Texas; this rapid increase of pressure was attended by high winds in the Missouri Valley and southward to the Gulf coast, and general frosts in the Mississippi Valley as far south as

the thirty-fifth parallel; these conditions also extended to the Rocky Mountain regions. During the 3d this area passed rapidly from the upper Missouri valley to Texas, where it was central on the morning of the 4th, after which the direction of movement changed to eastward, and it was last observed in the east Gulf states. On the morning of the 5th light frosts were reported in Alabama, Georgia, Tennessee, North Carolina, and Virginia.

II.—On the morning of the 4th a second area of high pressure appeared north of Washington Territory while the preceding area was central in the Southwest. The barometer continued above, or near, the normal at stations in the Rocky Mountain regions, while it was from .2 to .5 below the normal on the Atlantic coast and in the Saint Lawrence Valley, where a low area was central, attended by gentle winds in the Northern States and brisk to high westerly winds in the Lake region and on the middle Atlantic coast. This area moved to the southeastward as it increased in extent, but its centre followed the Missouri River and passed to the eastward; it followed the course of the Ohio Valley during the 5th, 6th, and 7th, causing frosts in the Northern States and as far south as Tennessee. These frosts proved injurious to vegetation in the Ohio Valley, but their occurrence had been previously announced by "frost warnings"; the first killing frost of the season also occurred at Boston, Massachusetts, on the morning of the 7th. When this high area was central over Virginia, a well-defined low area extended over southern Nova Scotia, which had caused heavy rains on the New England coast during the 6th; after reaching the Atlantic coast this high area moved to the northeastward over the middle Atlantic states, New England, and Nova Scotia, and disappeared to the north of the Gulf of Saint Lawrence on the 9th, the pressure increasing at the centre during the northeasterly movement, and when it was last observed the pressure had attained its maximum.

III.—This area appeared north of Montana on the morning of the 7th, but previous reports indicate that it developed west of the Rocky Mountains, and there were indications of a high area over the northern plateau regions on the afternoon of the 6th. This area, after passing to the eastward of the Rocky Mountains, moved southward over the Missouri Valley during the 8th, and after the centre had reached the latitude of Omaha, Nebraska, passed eastward over the Lake region and the middle Atlantic states during the 9th and 10th, attended by generally fair weather; it was central in Virginia on the morning of the 10th, when it had included within its limits a greater portion of the United States east of the Mississippi, and extended from the Saint Lawrence river to the Rio Grande Valley; during the 10th it moved northward to the Saint Lawrence Valley, with a cyclone advancing northward from southern Florida. The distribution of pressure on the morning of the 11th was as follows: A well-defined area of high pressure central near Montreal, Province of Quebec; the cyclone advancing northward, central in northern Florida; areas of low pressure central north of Minnesota, with the barometer .4 below the normal; low area central north of Nova Scotia, where the barometer was .3 below the normal; a second area of high barometer extended over the northern plateau region. After reaching the Saint Lawrence Valley, this area moved slowly eastward during the 12th and 13th, and disappeared over the north Atlantic on the 14th. It moved less rapidly than the cyclone which was to the southwest of it, and as the pressure increased within the high area the barometric gradients in the southwest quadrant were also increased, the difference of pressure being .9 between stations in the lower lake region and those to the northeast of New England.

IV.—As in the preceding area, this was first observed over the northern plateau region, but the pressure increased as it moved eastward to the Rocky Mountains, and it was central in Montana on the morning of the 17th; it extended over the upper Missouri valley, causing sleet and snow at the central Rocky Mountain stations, and cold northerly winds and rain at the southern Rocky Mountain stations on the morning of

the 18th. An area of low pressure developed in the Indian Territory during the 18th, while the barometer continued high in the extreme northwest; there was a slight advance to the northeastward during the 18th and 19th as the storm-centre, previously referred to, moved rapidly northward over the upper lake region, causing general rains in the Mississippi and Ohio Valleys and the Lake region; when the low area was central north of Lake Huron there was a rapid increase of pressure on the eastern slope of the Rocky Mountains and the centre of high area was transferred from northern Montana on the 20th to eastern Texas on the 21st; killing frosts were reported on the latter date at Cairo, Illinois, Fort Gibson and Fort Sill, Indian Territory. This area extended over the Southern States during the 21st, causing light frosts as far south as Pensacola, Florida, Augusta, Georgia, and Smithville, North Carolina, and killing frosts from Virginia to Arkansas on the morning of the 22d; this area disappeared during the 22d, by the gradual decrease of pressure.

V.—On the morning of the 26th the barometer was high in the region north of Minnesota and Dakota, the pressure having increased rapidly during the previous night, the area of low pressure having moved from Manitoba eastward to Lake Superior during the 25th; the pressure increased during the 26th at the northern Rocky Mountain stations, and on the 27th the centre of greatest pressure was north of Montana, there having been an apparent movement to the westward during the preceding twenty-four hours, and at the same time a low area had developed in Colorado. The high and low areas thus described moved slightly to the south of east over nearly parallel lines during the 27th, the former being central near Bismarck, Dakota, and the latter central near Saint Louis, Missouri, on the morning of the 28th; following this report, there was an apparent movement to the northward during the 28th, while the low area continued in a southeasterly course; as this movement carried the high area beyond the limits of the stations of observation its movement to the eastward can only be approximately determined, but as the storm-centre previously referred to moved southeastward on the Atlantic coast during the 30th, it apparently drew the high area to the southeastward. At the close of the month it was central in the Saint Lawrence Valley near Quebec, Province of Quebec, separating the storm which had disappeared over the north Atlantic and the low area which was forming in the Mississippi Valley. At the close of the month a sixth area of high pressure extended over the central and northern Rocky Mountain regions, having advanced to this position from the north Pacific coast, where it was first observed on the morning of the 30th.

AREAS OF LOW PRESSURE.

Eight areas of low pressure have been traced from the tri-daily charts for October; five were first observed on the eastern slope of the Rocky Mountains; one was a well-defined tropical storm which passed northward along the Atlantic coast and Florida; one probably originated on the north Pacific coast and passed eastward north of Lake Superior. These areas of low pressure all passed northeast as they approached the Atlantic coast, and the direction of movement was either directly east or inclined toward the southeast when their centres were to the eastward of the Mississippi Valley. Several slight areas of low pressure occurred within the limits of the stations of observation which have not been traced on the chart, although they are referred to in the text.

I.—On the afternoon of the 1st this area was north of Montana, with high areas to the southwest and to the eastward. General rains prevailed in the Southern States, and there were indications of a tropical storm passing northeastward east of the south Atlantic states; the general course of movement of this area was to the southeastward during the 1st and 2d, but as it was north of the stations of observation its centre could only be approximately located. On the morning of the 3d it was central near Lake Huron, attended by general rains in all districts east of the Mississippi; a cold wave was advancing

from the westward, which caused an increase of gradients in the west quadrant, and a high area to the eastward was passing over the north Atlantic. At the morning report of the 3d this depression changed its direction of movement to the northeast and followed the general course of the Saint Lawrence Valley during the 4th, followed by brisk and high westerly winds in the lower lake region and light snows in the northern portion of the upper lake region; after passing to the lower Saint Lawrence Valley it increased in energy, and on the 5th, when last observed, the barometer was below 29.30 near the centre of the disturbance, and severe westerly gales were reported in the Maritime Provinces; these gales continued until the 6th over the Gulf of Saint Lawrence, but the pressure was increasing and the storm soon passed to the northeastward.

II.—On the afternoon of the 6th this area of low pressure developed in the central Rocky Mountain region, while a high area covered the Mississippi and Ohio Valleys and a second high area was advancing from the northern plateau region; these conditions continued, with a slight easterly movement, until the morning of the 7th, when the low area was central in Iowa, the barometer being highest in the middle Atlantic states and Montana. During the succeeding twenty-four hours the movement was directly eastward, but the advance of the high area from the westward caused this area to disappear in the lower lake region before it reached the Atlantic coast. This depression caused no remarkable disturbance during its passage over the Lake region, and was only attended by light local showers, but its disappearance within the limits of the stations of observation makes this depression of special interest. At the time of the disappearance of this low area, the high area to the northeastward of New England was increasing and that to the westward was extending over the Saint Lawrence Valley; a low area of considerable energy was central north of Montana, and the succeeding reports show that the cyclone of the 7th was at that time central south of Florida.

III.—This area probably advanced from the north Pacific coast north of Washington Territory; it moved slowly eastward parallel with the northern portion of the United States during the 9th and 10th, and was a well-defined storm-centre. The isobars inclosing this storm extended southward after passing the Rocky Mountain regions, and the advance of the cold wave from the westward apparently forced the principal portion of this area to the northward, north of Manitoba, while feeble secondary depressions were formed in the barometric trough which extended south into Texas. The track of number iii therefore ended near Fort Garry, Manitoba, where on the morning of the 11th the barometer was below 29.60, and the wind was southeast, twenty-eight miles, while at neighboring stations to the westward it was from thirty to thirty-five miles per hour from the north. The afternoon report of the 11th showed a rapid increase of pressure at Fort Garry, Manitoba, and a northwesterly wind of twenty-five miles per hour. These reports show that the principal depression either moved to the northeastward or was replaced by the high area which at that time extended over the Rocky Mountain regions.

IV.—This, the most severe storm of the month, had its origin in the tropics, and when first observed was central southwest of Florida on the morning of the 10th, although the reports from that region indicate that it had its origin to the south or southeast of Cuba; it moved slowly northward over Florida and was well defined as a cyclone on the morning of the 11th. Northeasterly gales and heavy rains were reported on the Florida and Georgia coasts, with the barometer below 29.60. At this report, stations on the Atlantic coast were informed that a cyclonic disturbance was central in Florida and that the storm would probably cause dangerous gales off Cape Hatteras and Cape Henry, which would make it unsafe for vessels to sail south from northern ports. The storm continued its northerly course during the 11th and 12th, the centre passing west of Jacksonville, Florida, and Savannah, Georgia, and continuing near the eighty-second meridian until midnight of the 12th, when it was central in southwest Virginia, with danger-

ous northeast gales south of New York. On the morning of the 12th, when the storm was still central in South Carolina, stations on the Atlantic coast were again warned of the approach of this severe storm, and the observers at all stations were directed to inform those interested in shipping that it was not safe for vessels to leave port. At midnight of the 12th secondary areas were formed in the upper Mississippi and Ohio Valleys, accompanied by general rains, and by an extension of the low area to the northwest, the storm-centre was transferred to the Ohio Valley on the morning of the 13th; there were steep barometric gradients on the middle Atlantic and New England coasts, the storm-centre being bounded by the isobar for 29.6, which included the entire Ohio Valley and the southern portion of the Lake region. After this deviation of the course to the northwest, the storm passed to the northeastward over the lower lake region and the Saint Lawrence Valley, attended by severe gales in the Lake region and on the Atlantic coast and in the Maritime Provinces. Cautionary signals were displayed from twenty-four to forty-eight hours in advance of this storm, and the observer at New York reports, relative to the severity of the storm, as follows:

Cautionary signals were hoisted at 7.45 p. m., October 11th; the public was notified of the approach of the cyclone by the publication in the morning papers of October 12th of the telegram of October 11th; a special bulletin was issued at 10 a. m., October 12th, in which was incorporated telegram received that morning from office Chief Signal Officer—this bulletin was in the Maritime Exchange, and the public notified by "ticker," and the various steamship companies by telephone from this office. The storm struck here about daylight of October 13th, and is reported to have been very severe on the New Jersey coast, and the most severe gale known on the Sound for twelve years. No disasters have been reported in this vicinity, which is certainly due to the warnings given by the service. On the 13th, the day of the storm, no vessels entered or left this port, it being the first instance of the kind known for twenty-five years.

The following notes by the Signal Service observers refer to this storm:

Cedar Keys, Florida: the barometer fell rapidly during the 10th, with brisk northeasterly winds and light rain, which continued during the 11th; at 12.30 p. m. on the 11th the wind veered to southeast and increased in force, reaching a maximum velocity of forty-eight miles per hour at 4.30 p. m., with barometer at 29.19; at 5.30 p. m. the barometer had risen to 29.24 and the wind had decreased to twenty-four miles, but threatening weather continued during the remainder of the day; the high winds caused the tide to rise to an unusual height; the highest wharves were submerged and many of the principal streets flooded.

Sanford, Florida: the barometer fell throughout the 10th, accompanied by heavy rain and brisk to high northeasterly winds; the rainfall for seventeen hours was 6.09 inches, the heaviest recorded since the establishment of this station; the highest wind-velocity, thirty miles per hour, occurred at 4.30 p. m.; at 9 p. m. the heavy rain ended and light rain continued until 10.05 p. m.; during the morning of the 11th the wind veered to south, and the barometer continued to fall until 3 p. m., when it read 29.50; light rains fell between 10 and 11 a. m. and 4 and 8 p. m. of the 11th.

Jacksonville, Florida: the wind blew in strong gusts from the northeast during the 10th, and at 10.50 p. m. increased to the force of a gale, which continued, at intervals, until 2.45 a. m. of the 11th; at 7 a. m. of the 11th the wind had backed to north and had decreased to four miles per hour; at 11 a. m. it had veered to east and began to increase in force; later the wind veered to south and southwest, increasing to a gale, which continued until 5.30 a. m. of the 12th. The barometer was lowest, 29.42, at 10 p. m. of the 11th, and the highest wind-velocities were thirty-six miles, northeast, at 1.55 a. m. of the 11th, and thirty-six miles, south, at 11.15 p. m. on the same date.

Savannah, Georgia: heavy rain and high northeasterly winds prevailed throughout the 11th. During the morning the barometer fell slowly, but in the afternoon and during the night it fell rapidly, the lowest reading, 29.49, occurring at 1 a. m. of the 12th, afterwards remaining stationary until 7 a. m. At the time of the lowest barometric reading the wind shifted to south

and decreased in force from thirty-two to fifteen miles per hour. The high easterly and northeasterly winds caused the tide to rise to an unusual height, overflowing the adjacent rice fields. The Savannah River rose rapidly from 11 a. m. to 1 p. m., reaching a height eighteen inches above the highest point attained since the flood of August, 1881. Great damage was done to the railroads in this part of the state. No damage to shipping interests have been reported. The warning of the storm's approach was given eleven hours in advance, and enabled those interested to prepare for it.

Smithville, North Carolina: high southeasterly winds began at midnight of the 11-12th and continued, at intervals, until 1 p. m. of the 12th; a maximum velocity of forty-four miles occurred at 7.30 a. m. The timely warning of this storm given by the signal display occasioned much favorable comment.

Fort Macon, North Carolina: a southeasterly gale began at 7.10 p. m. on the 11th and continued until 6.30 a. m. of the 12th, the wind reaching a maximum velocity of fifty-six miles per hour.

Kitty Hawk, North Carolina: a gale began at 3 p. m. of the 12th and continued until about midnight of the 12-13th; a maximum velocity of fifty-three miles, southeast, occurred at 6.20 p. m. of the 12th.

Cape Henry, Virginia, 12th: a severe storm, from northeast to east, began during the early morning and continued until 2 a. m. on the 13th; the maximum velocity of the wind was forty-eight miles; the lowest reading of the barometer was 29.65.

Norfolk, Virginia: high northeasterly winds prevailed from noon of the 12th until past midnight. Considerable damage was done to unfinished buildings and other property in this vicinity. The signal ordered for this storm was heeded by all outward-bound vessels, and the display was favorably commented upon by the press of this city.

Cape Henlopen, Delaware: the storm which prevailed on the 12th and during the night of the 12-13th is said to have been as severe as the great storm of October, 1877. The timely warning given by the Signal Service of the approach of this storm was of the greatest value to shipping interests.

Barnegat City, New Jersey: a maximum wind-velocity of forty-eight miles, from the southeast, occurred at 9 a. m. the 13th.

Sandy Hook, New Jersey, 13th: an easterly gale, blowing steadily at the rate of from fifty to sixty miles per hour, with heavy rain, prevailed from 6 a. m. to 3.10 p. m.

Oswego, New York: the storm of the 13th began at 2.50 a. m. and continued until 8.10 p. m., the wind reaching a maximum velocity of forty-two miles, southeast, at 9.45 a. m. The storm caused considerable damage in this vicinity.

New Haven, Connecticut: high northeasterly winds prevailed during the 13th, which caused the tides to rise to an unusual height. The schooner "Minnehaha" was partly dismantled off Faulkner's Island.

V.—This storm developed in the Southwest immediately south of an area of high barometer which extended throughout the northern and central Rocky Mountain regions; general rains prevailed in the west Gulf states, and snow or sleet occurred in Nebraska, Kansas, and Colorado on the morning of the 18th, the centre of least pressure being south of Texas. Although an area of low pressure covered the Southwest, there was no movement until after midnight of the 18th, when the storm centre was located in the northwestern portion of Arkansas. The rapid flow of cold air from the northwest of this area forced this depression to the northeastward, and it passed over the central Mississippi valley and the upper lake region during the 19th, attended by general rains in the central valleys and in the Lake region. The pressure at the centre diminished as it approached the Lake region, where it attained its minimum on the afternoon of the 19th. This storm increased in energy as it moved northward until it passed beyond the limits of the upper lake region when it was followed by strong westerly winds and clearing, colder weather, the temperature falling below freezing in the northern part of the Lake region. This storm did not move down the Saint Lawrence Valley but apparently continued its northerly course over Hudson Bay.

VI.—Immediately after the disappearance of the storm traced as number v a feeble depression formed on the Atlantic coast south of New York, the centre being near Charlotte, North Carolina, at midnight of the 20th, attended by light, variable winds. The isobar bounding this depression was 30.0, the depression being of an elliptical form, extending from northern Virginia to southern Florida; this storm increased rapidly in energy and moved northeastward along the middle Atlantic coast during the 21st, the barometer falling rapidly at the centre, and the isobars bounding the centre retaining an elliptical form, with the longer axis extending north and south. The barometer attained its minimum when the centre reached Father Point, Province of Quebec, on the morning of the 22d. Moderate gales occurred at the Atlantic coast stations north of Cape Hatteras, and the heavy rains which marked the origin of this storm followed the storm-centre as it passed along the middle Atlantic coast and over the interior of New England.

VII and VIIa.—On the 27th a barometric trough extended from central Rocky Mountain stations to the lower lake region, with indications that a storm was developing in the western portion of Nebraska. Previous to this report a slight depression had moved southeastward from the extreme northwest over the upper lake region, and at the midnight report of the 26th the barometer was low in southern Michigan, the isobar of 30.0, inclosing this depression, extending from Lake Ontario to Missouri. When this depression was marked in central and west Nebraska there were indications of a storm in the Gulf, south of Louisiana, and a high area was north in Montana. The following reports during the 27th and 28th indicate a general southeast movement of the high and low areas, while the area of low pressure in the Gulf moved slowly to the northeastward and united with this depression in western North Carolina on the morning of the 29th. Very heavy rains fell on the 28th and 29th in eastern Tennessee, the middle, and south Atlantic states, and destructive freshets occurred in Virginia and West Virginia. After the union of these low areas the course of movement was to the northeast on the Atlantic coast, the barometer falling rapidly at the centre as the storm moved northeasterly with increasing energy; severe gales occurred from Smithville, North Carolina, northward to Nova Scotia, but the storm apparently reached its maximum energy while the centre was passing over the New Jersey coast, the barometer falling below 29.20 along the track of the centre.

The following letter, from the secretary of the Maritime Exchange in New York City, is published as an evidence of the value of the storm warnings issued by the Signal Service:

THE MARITIME ASSOCIATION OF THE PORT OF NEW YORK,
PRODUCE EXCHANGE BUILDING, BEAVER STREET,
New York, November 10, 1885.

Gen. W. B. HAZEN, U. S. ARMY,

Chief Signal Officer, Washington, D. C.

DEAR SIR: Highly appreciating, as we do, the invaluable service you are rendering the commerce of the country by advanced reports of approaching storms, may we venture, now that the stormy season is upon us, to suggest that these reports be telegraphed to us at the earliest possible moment.

Thanking you for the promptitude with which they have hitherto been sent us, we merely suggest that any improvement in that direction, if any be possible, will further add to their usefulness.

Instantly upon their receipt, if in time, we conspicuously bulletin the message at the Maritime Exchange, and notify the steamers about leaving port. As an illustration of their usefulness, I would say that Captain Garvin, of the steamer "Orinoco," which cleared for Bermuda on the 29th ultimo, on receiving from us the advanced report you kindly sent us on that day, came to anchor in the harbor, together with a number of other outward-bound vessels. He is enthusiastic in praise of the service rendered, and to-day informed me that the report referred to probably saved a large amount, especially in the cost of cattle being shipped abroad, which would probably have suffered heavy loss had the vessels encountered the storm of which you gave warning.

Very respectfully, yours,

(Signed) F. W. HOUGHTON, Superintendent.

Severe gales also occurred in the lower lake region and brisk to high winds were reported in the upper lake region, but signals were not displayed west of Lake Huron. This storm moved rapidly along the New England coast during the 30th, the centre passing between Eastport, Maine, and Yarmouth, Nova

Scotia, and then northeastward north of Sydney, Cape Breton, causing severe gales on the 31st at the most northeasterly stations, but the pressure near the centre of the storm was apparently increasing after it left the limits of the United States.

The following notes are from the reports of Signal Service observers:

Fort Macon, North Carolina: a southeasterly gale began at 9.25 p. m. on the 28th and continued until 5.05 a. m. of the 29th; at 1.35 p. m. the wind had shifted to high southwesterly and continued until 6.50 a. m. of the 30th; maximum velocities of forty-four miles, northeast, and forty-five miles, southwest, occurred during the storm.

Kitty Hawk, North Carolina: the barometer fell rapidly during the night of the 28-29th, with southeasterly winds and heavy rain; the wind attained the force of a gale at 1.45 a. m., and at 6 a. m. it reached a maximum velocity of seventy-six miles per hour. The barometer fell until 1 p. m., when the lowest reading, 29.19, was observed. The storm was apparently most severe between this place and a point nine miles northward. Within a distance of three miles sixty-five telegraph poles were broken off close to the ground, and a large number of trees were uprooted. The wind-velocity during this storm was the highest recorded since April, 1881, when the same velocity was attained. Considering the severity of this storm, the damage was very small. The storm-signal was displayed twelve hours in advance.

Barnegat City, New Jersey, 29th: high winds began at 9.45 a. m. and ended at 10 p. m.; a maximum velocity of fifty miles, northeast, occurred at 5.45 p. m.

Sandy Hook, New Jersey: a strong easterly gale, with light to heavy rains, prevailed on the 29th. The schooner "Charles H. Valentine" went ashore off the point of the Hook during the storm. This storm was marked by an unusual barometric range; at 11 p. m. of the 28th the barometer read 30.02, and at the same hour on the 29th it read 29.18—a range of .84.

Sandusky, Ohio: a gale began at 4.20 a. m. on the 29th and continued until 11.45 a. m. on the 30th; a maximum wind-velocity of fifty-three miles, north, occurred at 7.15 p. m. on the 29th.

Oswego, New York: the storm began at 6.55 p. m. on the 29th and continued until 4.50 p. m. of the 30th, the wind reaching a velocity of thirty-six miles, north, at 5.21 a. m.; this storm caused considerable damage to shipping interests.

VIII.—This storm developed in southeastern Colorado, within the southern limit of a barometric trough which extended northward to the British possessions, where a storm of considerable energy was central on the afternoon of the 30th; this storm, however, did not pass within the limits of the stations of observation, but the low area, number viii, moved slowly to the eastward with slight energy, attended by light rains in the central valleys, and at the midnight report of the 31st it had reached central Illinois, bounded by the isobars for 29.80 and 29.90, and the isobar for 30.00 forming the barometric trough which extended from Lake Superior to the west Gulf coast. At this report high areas extended over New England and the middle Atlantic states, and over the northern and central Rocky Mountain regions.

The following table gives the latitude and longitude in which the centre of each low area was first and last observed, with the average hourly velocity of each:

Low areas.	First observed.		Last observed.		Average velocity in miles per hour.
	Lat. N.	Long. W.	Lat. N.	Long. W.	
No. I	53 00	103 00	51 00	65 00	34.0
II	44 00	99 00	42 00	82 00	24.0
III	52 00	112 00	51 00	96 00	18.0
IV	24 00	83 00	48 00	67 00	19.5
V	36 00	94 00	49 00	81 00	21.0
VI	35 00	81 00	50 00	67 00	30.0
VII	41 00	102 00	47 00	61 00	26.0
VII a	28 00	90 00	36 00	82 00	30.0
VIII	38 00	101 00	41 00	90 00	22.0
Mean hourly velocity					26.8

NORTH ATLANTIC STORMS DURING OCTOBER, 1885.

[Pressure expressed in inches and millimetres; wind-force by scale of 0-10.]

The tracks of the areas of low pressure that have appeared over the north Atlantic Ocean are determined, approximately, from international simultaneous observations furnished by captains of ocean steamships and sailing vessels; abstracts of ships' logs and reports collected by the Signal Service agencies at the ports of New York, Boston, and Philadelphia; reports received through the co-operation of the "New York Herald Weather Service;" abstracts of ships' logs furnished by the proprietors of the "New York Maritime Register," and from other miscellaneous data received at this office up to November 21, 1885.

The distribution of pressure over the north Atlantic Ocean during October, 1885, appears to have been somewhat complicated. During the first decade of the month an area of high pressure occupied the region between W. 52° and W. 30°, and from N. 52° southward to N. 32°, while over the region east of the thirtieth meridian the pressure was constantly low. Especially was this the case in the vicinity of the British Isles, where, on the 1st and 2d, the barometer fell to 29.15 (740.4) in the northern districts, and again on the 10th, when a cyclone of great intensity (not charted) appeared suddenly over the English Channel. In the last mentioned the barometer fell to 28.9 (734.0) and gales of hurricane force, from w. and nw., occurred over the ocean from W. 25° eastward over the Bay of Biscay to the French coast. During the period above mentioned the barometric pressure over the western part of the ocean likewise fluctuated greatly, areas of high, or low, pressures occupying Newfoundland, the Maritime Provinces, and the south Atlantic coast region alternately. Towards the end of the first decade and the commencement of the second severe gales prevailed over the western part of the ocean, caused by the passage of the cyclone described as number iv under "Areas of low pressure," and also during that of the storm described below as number 6; the latter being probably identical with that which caused great loss of life and property along the Labrador coast on the 10th and 11th.

During the second decade of October, 1885, the high area over mid-ocean began to give way, while the pressure over the eastern part of the Atlantic and the British Isles increased; in the western part no marked changes occurred until near the end of the period, when an area of high pressures spread southward and westward from about W. 55° to the American coasts. On the 16th the pressure over mid-ocean and north of the fortieth parallel began to increase and the region of low pressures was apparently transferred to that part of the ocean lying south of the above-mentioned parallel, and in the vicinity of the Azores; the data at hand, however, are insufficient to determine the paths of the areas of low pressure that may have appeared in that neighborhood. During the last decade of the month areas of low pressure again predominated in the British Isles and over the ocean east of 25° W.; over mid-ocean the pressure remained high, except during the last five days of the period when it gave way in advance of the low areas numbered 12 and 14. In the western districts it remained moderately high until the 28th, when a decided decrease set in, caused by the passage northeastward of the cyclonic storm described as number vii under "Areas of low pressure."

Mr. J. Antonio Estopina, chief officer of the Spanish s. s. "Valencia," reports as follows: "The weather during the present month (October, 1885) at the ports of Vigo and Santander, Spain, has been very unsettled. Frequent and abundant rains, with winds from the fourth quadrant, accompanied by frequent strong squalls of wind, rain, and hail, have prevailed."

Captain George Mitchell, commanding the British s. s. "Trinacria," lying in the port of Denia, Spain, also reported: "On the 13th, 14th, and 15th very unsettled weather with strong ne. gales and heavy rain; tops of the hills covered with snow, which is something unusual in Spain at this time of the year; there must have been very bad weather north."

The following are brief descriptions of the low areas charted:

1.—This was probably a continuation of the low area traced as number vii on the chart for September, 1885; at the midnight report of September 30th the storm-centre had passed off the Florida coast, and on the morning of October 1st it was apparently southeast of Charleston, South Carolina, the wind increasing to hurricane force at sea towards the evening of that day. The s. s. "Lone Star," Geo. W. Mason, commanding, reported a n. to ne. hurricane of force 10 (12, Beaufort scale); the lowest barometric reading, 29.64 (752.8), was at 7 p. m., in N. 32° 17', W. 77° 45'. Captain Mason reports: "Hove-to on the starboard tack, and at 10 p. m. the wind had moderated to a fresh gale, although a heavy cross-sea was still running." The s. s. "Finsbury," S. E. Greystone, commanding, had light, variable winds, with heavy ne. sea-swell during the afternoon of the 1st; barometer at noon, 29.75 (755.6), in N. 26° 42', W. 79° 45'. On the 2d the storm-centre was in the neighborhood of Cape Hatteras and moderate to strong e. gales prevailed at Hatteras and other coast stations, and also at sea. The s. s. "Claribel," T. M. McKnight, commanding, reported a fresh to strong gale from the e., suddenly shifting to s. at about 9 a. m. of the 2d, in N. 35° 20', W. 73° 40'. During the 3d strong south and southwesterly winds prevailed near the coasts of the United States, and this low area probably united with that charted as number i, which on the 3d occupied the Lake region.

2.—During the 1st and 2d the observations indicated the presence of a slight depression over the region between N. 35° and 40° and W. 60° and 65°, and the report of Captain Mehegan, commanding the s. s. "Joseph Ferrens," shows that a gale prevailed in connection therewith. The "Joseph Ferrens," in N. 37° 50', W. 60° 39', had a gale from s. to sw. and w. during the 1st and 2d; the lowest barometer, 29.71 (754.6), being observed at midnight of the 1st, in the above position. By the 3d this depression had apparently filled in.

3.—This area of low pressure appeared to the northwest of the British Isles on the 1st, and was attended by moderate to strong gales from w. and sw. over the ocean from about W. 20° eastward to the British coasts, and southward to the Bay of Biscay. On the 2d the centre of low pressure was to the northward of Scotland, with pressure about 29.1 (739.1), the w. and sw. gales continuing until the 3d.

4.—This low area apparently approached the British coasts from the northwest during the 4th, and passed eastward north of Scotland on the following day. The lowest pressure reported at sea was 29.22 (742.2) on the 4th, in about N. 56°, W. 16°, where a w. gale of force 8-9 prevailed.

5.—This area of low pressure appeared near the coast of Nova Scotia on the 7th; the pressure near the storm-centre was about 29.5 (749.3), and moderate westerly gales were reported near N. 41°, W. 67°, while strong southeasterly winds prevailed over the region between N. 40° and 45° and W. 50° and 60°. By the 8th it had disappeared from the chart.

6.—This was a cyclone which appeared on the 9th and which subsequently developed great energy during its passage north-northeastward. Its presence was clearly indicated on the morning of the 9th by the directions of the winds over the region between N. 35° and 43° and from W. 60° to 70°; the pressure over the region mentioned ranged from 29.7 (754.4) to 30.0 (762.0) on the morning of the 9th, but a decrease set in during the day; north of 40° N., and between W. 60° and 65°, the winds were from e. and ne., blowing with the force of a gale; to the eastward of W. 60° they were s. and se., strong breeze to moderate gale; north of Bermuda they were sw. and w., moderate in force, and over the ocean west of 65° W. they were from n., blowing with the force of a strong gale. The s. s. "Lorenzo D. Baker," W. F. Wiley, commanding, reported barometer 30.04 (763.7), falling, at about 7 a. m. (ship's time), in N. 37° 07', W. 70° 0', wind nne., force 8; the s. s. "British Prince," S. Nowell, commanding, at 7.47 a. m. (ship's time), in N. 39° 44', W. 66° 33', had barometer 29.86 (758.4), wind nnw., force 9; the s. s. "Columbia," R. T. Garvie, com-

manding, in N. $42^{\circ} 3'$, W. $63^{\circ} 41'$, barometer 29.74 (755.4), wind ne., force 9; and the s. s. "Elbe," F. Hamelmann, commanding, in N. $42^{\circ} 5'$, W. $61^{\circ} 54'$, barometer 29.72 (754.9), wind e., force 8; the s. s. "Orinoco," J. S. Garvin, commanding, in N. $34^{\circ} 24'$, W. $66^{\circ} 40'$, barometer 30.03 (762.7), wind sw., force 6, overcast; the bark "Exile," G. J. Pearce, commanding, in N. $41^{\circ} 27'$, W. $58^{\circ} 25'$, barometer 29.85 (758.2), wind se., force 8, rain.

The s. s. "Celtic," B. Gleadell, commanding, reported a whole gale on the 9th from se. to s., sw., w., nw., n., ne., n., and nw., the wind attaining its greatest force when at nw.; the lowest reading was 29.44 (747.8), at 7 p. m., in N. $42^{\circ} 15'$, W. $63^{\circ} 04'$; at 4 p. m. on the 9th the barometer on board the s. s. "Columbia" had fallen to 29.59 (751.6), and the wind shifted from ne. to n., vessel's position being N. $42^{\circ} 08'$, W. $64^{\circ} 48'$. The s. s. "Aurania," W. H. P. Hains, commanding, reported on the 9th at noon (ship's time), in N. $44^{\circ} 33'$, W. $53^{\circ} 55'$, strong se. wind, barometer 29.85 (758.2), wind gradually increasing and veering to s. and ssw.; midnight, fresh gale, barometer 29.45 (748.0); on the 10th, at 8 a. m., in N. $42^{\circ} 57'$, W. $59^{\circ} 47'$, lowest depression of barometer, 29.29 (744.0), wind suddenly shifting to nw., from which quarter it blew a gale of force 10 for several hours. During the 10th the cyclone passed north-northeastward over Newfoundland, causing strong ne. gales in the Gulf of Saint Lawrence, and strong ssw. to sw. gales on the Banks of Newfoundland. On the 11th the cyclone was apparently to the northeast of Newfoundland; although the actual centre was probably nearer the Labrador coast, as the observations from vessels north of 46° N., and between Newfoundland and W. 40° show pressures ranging from 29.3 (744.2) to 29.6 (751.8). The winds had now shifted to w. and nw. over the ocean from W. 60° to 45° , and between N. 40° and 47° , but continued to blow with the force of 9 to 10; while those to the eastward of W. 45° and north of 47° N. were from s. to sw., strong breezes to moderate gales. On the 12th the low area was apparently central near N. 50° , and between W. 40° and 45° , but it appeared to be losing energy, as the pressure had increased to 29.7 (754.4) and the winds were slowly but gradually decreasing in force; by the following day they had fallen, generally, to a moderate or fresh breeze, except over the region east of W. 30° , where the barometric gradients were steep and the southerly winds attained the force of a gale. This low area was checked by an area of high pressures which existed to the northward and eastward, and was probably closely connected with number 7, which appeared in the same neighborhood on the 14th.

The following press reports refer to the damage caused on the Labrador coast by this cyclone:

An immense amount of damage was done on the Labrador coast by a storm on October 11th. The storm extended over the whole length of coast from Battle Harbor north to Cape Harrison. Over sixty lives are supposed to have been lost, and the destruction of fishing craft was enormous.

HALIFAX, NOVA SCOTIA, October 27.—A dispatch received to-day from Saint John's, Newfoundland, says: 'A great storm raged off the coast of Labrador on the 11th instant, doing immense damage among the fishing fleet gathered there. Eighty vessels were wrecked or driven ashore, and at least seventy men from the crews of the vessels lost their lives. Two thousand persons are now ashore in a destitute condition. The news created great excitement here. Steamers will be immediately dispatched to the scene of the disaster, with provisions, clothing and other comforts for the use of the castaways.'

SAINT JOHN'S, NEWFOUNDLAND, October 28.—The hurricane that raged on the Labrador coast was unprecedented even in that inclement region. Over seventy vessels, and probably 300 lives, were lost. The particulars so far are meagre, there being no telegraphic communication.

7.—During the 13th the atmospheric pressure over the ocean, between N. 45° and 50° and W. 30° and 40° , ranged from 29.8 (756.9) to 30.0 (762.0), and the winds were moderate or fresh; by the 14th, however, the pressure near N. 49° , W. 38° , had decreased to 29.4 (746.7) and the winds increased in force on both sides of the storm-centre, but especially in the western semi-circle, where the north winds attained the force of a strong gale. On the 15th the area of low pressure spread southward and the winds shifted to ne. and e., and continued to blow a gale, the lowest barometer reported being 29.68 (753.9), in N. 45° , W. 40° , wind ne., force 7, confused nne. and

se. sea-swell. On the 16th and 17th the area of low pressure appeared to be to the westward and southward of the Azores, but the data are insufficient to definitely determine its position.

8.—This area of low pressure appeared over the Bay of Biscay on the 16th, with the pressure near the storm-centre about 29.7 (754.4), and attended by moderate gales on the French coast and over the ocean westward to the twentieth meridian. The centre of this low area appears to have pursued an abnormal course, having moved from the Bay of Biscay westward out into the ocean. On the 17th it was shown near N. 48° , W. 15° , where the barometer read 29.8 (756.9), and by the following day it had disappeared from the chart.

9.—This area appeared near the mouth of the English Channel on the 21st, the barometer at the centre of the low area falling to 29.49 (749.0); moderate sw. to w. and nw. gales prevailed over the Bay of Biscay and off the British coasts. On the 22d this area passed northeastward and beyond the range of the marine observations.

10.—This area of low pressure appeared off the southwest coast of Ireland on the 22d, with barometer about 29.5 (749.3), and accompanied by moderate w. gales near the fiftieth parallel. During the day it moved southeastward and probably joined an area of low barometer, which, on the 23d, was central over the southern part of the Bay of Biscay.

11.—This area apparently formed over the southern part of the Bay of Biscay on the 23d, and, in conjunction with that referred to above (number 10), caused strong n. gales over the ocean between W. 10° and 20° , and equally strong e. and se. gales over the British Isles and the Channel. On the 23d the s. s. "Bessel," C. J. Watson, commanding, reported barometer 29.4 (746.7), in N. $46^{\circ} 54'$, W. $10^{\circ} 0'$, wind veering to n., force 9.

12.—This area of low pressure appeared on the 23d to the southeastward of Nova Scotia; on that, and during the following day, the winds did not exceed the force of a strong breeze, nor did the pressure fall below 29.8 (756.9), but on the 25th, when the storm-centre passed to the northward of the fiftieth parallel, southwesterly gales of force 8 to 9 were reported. On the 26th this area was shown to the eastward of the twenty-fifth meridian, and on the following date it probably became merged in an area of low pressure which occupied the British Isles.

13.—This area appeared over the ocean between W. 15° and 20° , and north of the fifty-fifth parallel on the 25th; during the day the low area passed over the British Isles, with pressure near the centre about 29.35 (745.5), and attended by moderate to strong westerly and northerly gales which were felt at sea westward to the twentieth meridian.

14.—This area of low pressure was developed to the eastward of Newfoundland on the 27th, on which date the pressure over the ocean between W. 40° and 50° ranged from 29.75 (755.6) to 30.0 (762.0), and cloudy or rainy weather, with strong winds from s. to e., ne., and n. prevailed in that region. By the following day (28th) the low area had moved northeastward and was central near N. 50° , W. 38° , where the barometer now read 29.6 (751.8), and the wind still remained moderate in force. Moving east northeastward, with no material change in pressure, the low area on the 29th was shown near N. 51° , W. 25° , the winds in the western quadrants of the low area having increased to the force of a moderate to strong gale. On the 30th this low area was apparently central in Ireland, the pressure, as indicated by the marine observations near the Irish coast and in the Channel, being less than 29.6 (751.8); strong nw. gales prevailed over the ocean between the Irish coast and W. 20° , while moderate to strong w. gales were reported over the northern part of the Bay of Biscay.

The passage of low areas numbers iv and vii (described under "Areas of low pressure") along the coast of the United States was attended by strong gales at sea; in the former the gales were felt over the ocean from the coast line eastward to W. 70° , and in the latter they extended, on the 30th, as far eastward as the sixtieth meridian.

OCEAN ICE.

On chart i are shown the positions of the icebergs that have been observed in the north Atlantic during October, 1885, as obtained from reports sent to this office by shipmasters, and from other data published in the "New York Maritime Register."

No icebergs were observed south of the forty-eighth parallel, nor east of the forty-seventh meridian, during October, 1885. A few bergs were reported near the Strait of Belle Isle.

In the preceding month (September) icebergs, though few in number, were encountered as far south as the forty-fifth parallel, and eastward to about W. 46°; thus, a comparison between the two months shows that the bergs are rapidly disappearing from the route of trans-Atlantic steamers.

The following is a comparison between October, 1885, and the same month in the three preceding years:

Southern limit.			Eastern limit.		
Date.	Lat. N.	Lon. W.	Date.	Lat. N.	Lon. W.
October, 1882*	0 1	0 1	October, 1882*	0 1	0 1
October, 1883	46 55	46 22	October, 1883	46 55	46 22
October, 1884	near Cape Race		October, 1884	46 56	50 55
October, 1885	48 21	47 12	October, 1885	48 21	47 12

* No icebergs were reported in October, 1882.

Icebergs were reported as follows:

3d.—S. S. "Saint Laurent," in N. 48° 32', W. 50° 32', passed seven miles south of a small iceberg.

14th.—S. S. "Boston City," in N. 48° 21', W. 47° 12', passed a small iceberg; s. s. "Foscolia," in N. 51° 55', W. 54° 06', passed a large iceberg, also two large bergs to the north-eastward of Belle Isle.

21st.—S. S. "Caspian," in N. 52° 16', W. 53° 19', passed several icebergs; s. s. "Lake Champlain" passed several icebergs when within about fifty miles of Belle Isle.

26th.—S. S. "Ontario," in N. 52° 06', W. 53° 00', passed three large icebergs and one small berg.

31st.—S. S. "Toronto" passed two icebergs off Belle Isle.

SIGNAL SERVICE AGENCIES.

Signal Service agencies have been established in the Maritime Exchange buildings at New York City and Philadelphia, and in the Custom-House, Boston, where the necessary blanks and other information will be furnished to ship-masters.

In pursuance of the arrangements made with the Meteorological Office of London, England, there were cabled to that office from New York during October, 1885, eight reports concerning storms encountered by vessels in the Atlantic west of the forty-fifth meridian; three messages were sent from Boston.

TEMPERATURE OF THE AIR.

[Expressed in degrees, Fahrenheit.]

The distribution of mean temperature over the United States and Canada for October, 1885, is exhibited on chart ii by the dotted isothermal lines; and in the tables of miscellaneous data are given the monthly mean temperatures, with the departures from the normal, for the various stations of the Signal Service.

In the Rocky Mountain and Pacific coast districts, and in northern New England, the mean temperature for the month has been above the normal, the departures being greatest in the northern slope, northern and middle plateau districts, and in portions of the northern and middle Pacific coast regions, where the mean temperature ranged from 3° to 7° below the normal. To the eastward of a line extending from southwestern New Mexico north-northeastward to Manitoba the mean temperature in all districts, except northern New England, has been below the normal, the departures being most marked in the Gulf States and in portions of the upper Mississippi and Ohio valleys, Lake region, Tennessee, and the south Atlantic

States, where the monthly mean temperatures ranged from 4° to 7° below the normal.

The following are some of the most marked departures from the normal:

Above normal.		Below normal.	
	°		°
Fort Shaw, Montana	7.1	Chattanooga, Tennessee	8.1
Winnemucca, Nevada	6.7	Atlanta, Georgia	7.6
Fort Assinaboine, Montana	6.1	Fort Smith, Arkansas	7.3
Portland, Oregon	5.7	Pensacola, Florida	7.2
Helena, Montana	5.3	Palestine, Texas	6.6
Cape Mendocino, California	4.2	Charlotte, North Carolina	6.4
Sacramento, California	4.0	Columbus, Ohio	5.9
Red Bluff, California	3.9	Shreveport, Louisiana	5.5

In the following table are given the mean temperatures for the several geographical districts, with the normals and departures, as deduced from Signal Service observations:

Average temperatures for October, 1885.

Districts.	Average for Oct. Signal-Service observations.		Comparison of Oct., 1885, with the average for several years.
	For several years.	For 1885.	
	°	°	°
New England	51.9	50.7	- 1.2
Middle Atlantic States	57.9	56.1	- 1.8
South Atlantic States	66.2	62.3	- 3.9
Florida Peninsula	74.5	71.2	- 3.3
Eastern Gulf States	67.3	61.1	- 6.2
Western Gulf States	68.7	63.7	- 5.0
Rio Grande Valley	74.9	71.9	- 3.0
Tennessee	61.3	56.0	- 5.3
Ohio Valley	57.1	52.9	- 4.2
Lower Lake region	52.6	49.5	- 3.1
Upper Lake region	48.0	44.6	- 3.4
Extreme Northwest	42.5	41.7	- 0.8
Upper Mississippi Valley	54.0	49.7	- 4.3
Missouri Valley	51.1	48.3	- 2.8
Northern slope	43.3	47.1	+ 3.8
Middle slope	51.9	49.6	- 2.3
Southern slope	63.1	60.8	- 2.3
Southern plateau	60.4	62.8	+ 2.4
Middle plateau	49.0	53.8	+ 4.8
Northern plateau	47.2	50.4	+ 3.2
North Pacific coast region	50.8	54.4	+ 3.6
Middle Pacific coast region	58.6	61.7	+ 3.1
South Pacific coast region	65.8	68.0	+ 2.2

RANGES OF TEMPERATURE.

The monthly, and the greatest and least daily ranges of temperature are given in the tables of miscellaneous meteorological data.

The monthly ranges were greatest in the Rocky Mountain regions, extreme northwest, and upper Missouri valley; they were least along the middle and north Pacific coasts and on the Atlantic and Gulf coasts.

The following are some of the greatest and least monthly ranges:

Greatest.		Least.	
	°		°
Poplar River, Montana	72.5	Tatoosh Island, Washington Territory	14.4
Fort Yates, Dakota	70.7	Key West, Florida	18.3
Fort Sully, Dakota	68.6	San Francisco, California	23.2
Lake View, Oregon	68.2	Fort Canby, Washington Territory	24.3
Moorhead, Minnesota	66.3	Pysht, Washington Territory	26.5
Fort McDowell, Arizona	66.0	New Orleans, Louisiana	31.3
Willcox, Arizona	66.0	Galveston, Texas	32.3
Fort Bennett, Dakota	65.8	Hatteras, North Carolina	33.2

Chart v shows the ranges of extreme temperature over the United States, as determined from observations at Signal Service stations, during a series of years. The lines show the difference between the highest temperature of summer and the lowest temperature of winter as observed during the period of observations: For example, at Boston, Massachusetts, September 7, 1881, maximum temperature, 101° 5, and January 24, 1882, minimum, -13°, giving a range of 114° 5; Chicago, Illinois, July 6, 1874, maximum, 99°, and December 24, 1872, minimum, -23°, range, 122°; Detroit, Michigan, July 23,

1878, maximum, 100°, and December 22, 1872, minimum, -24°, range, 124°; Fort Benton, Montana, August 6, 1881, maximum, 108°, and December 29, 1880, minimum, -59°, range, 167°; Poplar River, Montana, August 14, 1884, maximum, 99°.8, and January 1, 1885, minimum, -63°.1, range 162°.9; Saint Paul, Minnesota, July 1, 1883, maximum, 100°, and December 25, 1879, minimum, -39°, range 139°; Washington City, September 7, 1881, maximum, 104°.3, and January 1, 1881, minimum, -14°, range 118°.3; Yankton, Dakota, in August, 1873 and in July 1, 1883, maximum, 103°, and December 25, 1879, minimum -34, range 137°.

DEVIATIONS FROM NORMAL TEMPERATURES.

In the table below are given, for certain stations, as reported by voluntary observers, the normal temperatures for October for a series of years, the mean temperature for October, 1885, and the departures from the normal:

Station.	County.	Normal temperature for October.	Number of years.	Mean temperature for Oct., 1885.	Departure.
<i>Arkansas.</i>		0		0	0
Lead Hill.....	Boone.....	63.4	4	56.0	-7.4
<i>California.</i>					
Sacramento.....	Sacramento.....	59.2	19	60.4	+1.2
<i>Connecticut.</i>					
Middletown.....	Middlesex.....	50.5	27	49.9	-0.6
New Haven.....	New Haven.....	51.4	99	51.6	+0.2
<i>Dakota.</i>					
Webster.....	Day.....	51.4	3	45.3	-6.1
<i>Illinois.</i>					
Anna.....	Union.....	60.8	10	54.6	-6.2
Mattoon.....	Coles.....	56.1	5	53.0	-3.1
Peoria.....	Peoria.....	53.7	31	52.3	-1.4
Riley.....	McHenry.....	47.3	25	44.8	-2.5
Sycamore.....	De Kalb.....	51.8	4	44.8	-7.0
<i>Indiana.</i>					
Lafayette.....	Tippecanoe.....	53.0	6	48.8	-4.2
Logansport.....	Cass.....	55.7	26	51.3	-4.4
Mauzy.....	Rush.....	53.4	.....	44.6	-8.8
Spiceland.....	Henry.....	51.8	31	48.8	-3.0
Vevay.....	Switzerland.....	56.2	21	53.9	-2.3
<i>Iowa.</i>					
Monticello.....	Jones.....	49.6	31	45.4	-4.2
<i>Kansas.</i>					
Independence.....	Montgomery.....	58.8	14	54.4	-4.4
Lawrence.....	Douglas.....	54.8	18	51.2	-3.6
Wellington.....	Sumner.....	57.8	7	53.9	-3.9
Yates Centre.....	Woodson.....	55.5	5	50.5	-5.0
<i>Maine.</i>					
Belfast.....	Waldo.....	47.0	26	47.7	+0.7
Bridgton.....	Cumberland.....	47.4	11	46.6	-0.8
Gardiner.....	Kennebec.....	47.3	49	47.6	+0.3
<i>Maryland.</i>					
Fallston.....	Harford.....	55.5	15	53.3	-2.2
<i>Massachusetts.</i>					
Amherst.....	Hampshire.....	48.8	48	50.0	+1.2
Cambridge.....	Middlesex.....	50.4	63	50.2	-0.2
Lowell.....	Middlesex.....	50.8	10	49.7	-1.1
New Bedford.....	Bristol.....	52.1	74	51.3	-0.8
Springfield.....	Hampden.....	51.2	18	50.8	-0.4
Somerset.....	Bristol.....	53.4	15	53.5	+0.1
Taunton.....	Bristol.....	54.6	15	52.1	-2.5
Williamstown.....	Berkshire.....	46.5	29	47.5	+1.0
Worcester.....	Worcester.....	51.0	43	47.5	-3.5
<i>Missouri.</i>					
Chambers.....	Osage.....	57.1	12	52.7	-4.4
<i>Nevada.</i>					
Carson City.....	Ormsby.....	47.9	6	52.1	+4.4
<i>New Brunswick.</i>					
Saint John.....	Saint John.....	45.8	25	46.8	+1.0
<i>New Hampshire.</i>					
Concord.....	Merrimac.....	50.9	18	49.3	-1.6
Concord.....	Merrimac.....	48.5	.....	48.3	-0.2
Hanover.....	Grafton.....	46.1	26	45.5	-0.6
<i>New Jersey.</i>					
South Orange.....	Essex.....	53.5	16	52.2	-1.3
<i>New York.</i>					
North Volney.....	Oswego.....	49.0	18	46.7	-2.3
Palermo.....	Oswego.....	47.0	32	46.1	-0.9
<i>Ohio.</i>					
Wauseon.....	Fulton.....	51.5	15	46.9	-4.6
<i>Pennsylvania.</i>					
Dyberry.....	Wayne.....	46.9	18	45.6	-1.3
<i>Rhode Island.</i>					
Providence.....	Providence.....	50.7	51	51.9	+1.2
<i>Vermont.</i>					
Lunenburg.....	Essex.....	44.6	37	45.7	+1.1
Newport.....	Orleans.....	46.3	10	45.7	-0.6
Woodstock.....	Windsor.....	44.1	18	44.7	+0.6
<i>Virginia.</i>					
Bird's Nest.....	Northampton.....	61.9	16	62.1	+0.2
Dale Enterprise.....	Rockingham.....	50.0	5	56.0	+6.0
Variety Mills.....	Nelson.....	58.3	8	52.0	-6.3
<i>West Virginia.</i>					
Helvetia.....	Randolph.....	52.6	9	47.5	-5.1
<i>Wisconsin.</i>					
Wausau.....	Marathon.....	46.6	6	40.6	-6.0

* From the "Bulletin of the New England Meteorological Society."

FROSTS.

Frosts occurred in the various states and territories during the month, as follows:

Alabama.—Mobile, 5th (in the suburbs of the city), 22d, 23d; Montgomery, 14th, 22d, 31st; Greenborough, 22d, 23d.

Arizona.—10th to 15th, 18th, 20th, 21st, 29th, 30th, 31st.

Arkansas.—4th, 14th, 21st, 22d.

California.—San Francisco, 10th; Sacramento, 11th, 12th, 24th, 25th; Susanville, 12th to 28th; Murietta, 30th.

Colorado.—1st to 7th, 11th to 15th, 19th to 31st.

Connecticut.—2d, 7th to 10th, 12th, 16th, 17th, 22d to 27th, 30th, 31st.

Dakota.—1st, 3d to 8th, 11th to 31st.

District of Columbia.—7th, 11th, 22d, 23d, 25th, 26th.

Florida.—Pensacola, 22d, 23d.

Georgia.—Atlanta, 5th, 21st to 24th, 26th, 31st; Augusta, 22d, 23d, 25th, 26th, 30th; Athens, 22d, 23d, 25th, 26th, 31st; Milledgeville, 22d, 23d.

Idaho.—11th to 22d, 25th, 27th, 31st.

Illinois.—1st, 3d to 10th, 13th, 15th, 16th, 20th to 25th, 28th to 31st.

Indiana.—6th to 10th, 15th, 20th to 26th, 30th, 31st.

Indian Territory.—4th, 6th, 13th, 21st, 22d, 29th.

Iowa.—3d to 9th, 13th to 16th, 18th to 24th, 28th to 31st.

Kansas.—1st, 3d to 9th, 12th, 13th, 14th, 18th to 23d, 25th, 28th, 29th, 30th.

Kentucky.—7th, 9th, 15th, 21st to 24th, 31st.

Louisiana.—Liberty Hill, 14th, 21st, 22d; Point Pleasant, 14th, 15th, 21st, 22d; Shreveport, 14th, 20th, 21st, 22d.

Maine.—6th to 13th, 17th, 18th, 24th to 27th, 31st.

Maryland.—22d to 25th.

Massachusetts.—1st, 7th to 10th, 12th, 16th, 17th, 22d to 26th, 30th, 31st.

Michigan.—2d, 4th to 11th, 15th to 31st.

Minnesota.—3d to 6th, 8th, 12th to 18th, 21st to 26th, 28th, 29th.

Mississippi.—Vicksburg, 15th, 21st, 22d.

Missouri.—4th, 6th, 14th, 20th, 21st, 23d, 29th, 30th.

Montana.—3d to 8th, 12th to 25th, 27th, 30th, 31st.

Nebraska.—1st to 8th, 13th to 17th, 19th to 23d, 25th, 26th, 28th, 29th, 31st.

Nevada.—1st, 2d, 3d, 7th, 9th to 28th, 31st.

New Hampshire.—5th, 6th, 7th, 10th to 13th, 15th, 16th, 17th, 23d to 26th.

New Jersey.—5th, 7th, 8th, 10th, 11th, 17th, 22d to 27th, 30th, 31st.

New Mexico.—1st, 4th to 8th, 11th to 14th, 19th to 22d, 24th to 28th.

New York.—4th, 6th to 12th, 16th, 17th, 22d to 26th, 30th, 31st.

North Carolina.—Weldon, 5th, 22d; Asheville, 5th, 16th, 22d to 27th, 31st; Raleigh, 5th, 22d to 25th; Flat Rock, 5th; Reidsville, 5th to 8th, 21st to 24th; Smithville, 22d, 23d; Charlotte, 5th, 22d, 23d, 31st; New River Inlet, 24th.

Ohio.—5th, 7th to 11th, 16th, 17th, 18th, 21st to 27th, 29th, 30th, 31st.

Oregon.—1st, 7th, 10th, 11th, 12th, 14th to 21st, 23d, 25th, 27th.

Pennsylvania.—5th to 11th, 17th to 28th, 30th, 31st.

Rhode Island.—7th, 8th, 23d.

South Carolina.—Stateburg, 5th, 22d to 26th, 31st; Pacolet, 5th, 22d, 23d, 31st; Spartanburg, 5th, 22d, 23d, 31st; Charleston, 23d.

Tennessee.—4th, 5th, 7th, 9th, 10th, 15th, 21st to 25th, 30th, 31st.

Texas.—Cleburne, 13th, 20th, 21st, 29th; Corsicana, 20th; Palestine, 14th, 20th, 22d, 29th; Fort Davis, 13th, 19th, 20th; Abilene, 20th, 21st; El Paso, 13th, 29th.

Utah.—11th, 12th, 13th, 18th to 22d, 24th, 25th, 27th, 28th, 31st.

Vermont.—7th to 12th, 16th, 17th, 22d to 27th, 31st.

Virginia.—5th, 7th to 11th, 16th, 18th, 22d to 28th, 31st.

Table of comparative maximum and minimum temperatures for October.

State or Territory.	Station.	For 1885.		Since establishment of station.			
		Max.	Min.	Max.	Year.	Min.	Year.
Alabama	Mobile	82.2	40.7	93.0	1884	34.0	1873
Do	Montgomery	79.4	40.0	90.1	1884	33.0	1873
Arizona	Prescott	84.0	29.8	86.0	1877	18.0	1880
Do	Fort Apache	86.9	29.8	85.3	1884	19.0	1880
Arkansas	Fort Smith	87.8	32.0	94.7	1883	39.0	1884
Do	Little Rock	83.3	38.8	91.0	1881	39.0	1880
California	San Francisco	76.0	52.8	84.0	1871	45.0	1881
Do	Red Bluff	96.0	46.0	94.0	1877	32.0	1881
Colorado	Denver	80.1	21.9	86.0	1873	1.0	1873
Do	Pike's Peak	36.4	-1.2	47.0	1879	-17.0	1878
Connecticut	New Haven	76.0	31.5	86.0	1881	24.0	1879
Do	New London			82.7	1879	27.2	1883
Dakota	Fort Buford	78.2	15.4	95.0	1879	9.0	1881
Do	Yankton	83.1	25.5	89.0	1879	9.0	1878
Delaware	Cape Henlopen	79.0	37.5				
Do	Del. Breakwater			84.0	1881	34.5	1884
District of Columbia	Washington City	75.5	35.3	92.3	1881	20.0	1873
Florida	Jacksonville	84.6	49.4	92.0	1883	40.0	1873
Do	Key West	87.4	69.1	92.0	1870	65.0	1870
Georgia	Atlanta	73.9	37.0	90.8	1884	33.6	1884
Do	Savannah	82.4	47.0	93.0	1884	37.0	1873
Idaho	Boisé City			85.0	1879, 1880	19.0	1878
Do	Lewiston	79.0	31.3	84.0	1880	26.0	1881
Illinois	Calro	78.1	38.8	88.0	'72, '81, '84	24.0	1873
Do	Chicago	69.0	35.6	83.4	1884	25.0	1873
Indiana	Indianapolis	77.8	31.4	87.0	1884	23.0	1878
Indian Territory	Fort Sill	88.0	33.0	91.0	1878	25.0	1878
Iowa	Dubuque	77.2	27.7	86.0	1879	20.0	1873
Do	Keokuk	77.5	30.0	87.0	1879	20.0	1873
Kansas	Dodge City	83.0	29.2	90.0	1883	10.0	1878
Do	Leavenworth	77.0	30.0	89.0	1871, 1874	19.0	1873
Kentucky	Louisville	79.0	39.7	90.0	1884	27.0	1878
Louisiana	New Orleans	80.2	48.9	90.8	1884	40.0	1873
Do	Shreveport	83.4	38.4	95.0	1883	31.0	1873
Maine	Eastport	61.0	29.4	80.0	1879	24.0	1881
Do	Portland	68.5	29.8	83.0	1879, 1881	28.0	1876, 1879
Maryland	Baltimore	76.1	38.0	89.0	1879, 1881	30.0	'73, '76, '79
Massachusetts	Boston	73.4	32.9	91.0	1881	25.0	1879
Michigan	Detroit	72.3	28.2	85.0	1879, 1884	22.0	1873
Do	Marquette	70.0	26.7	87.0	1879	18.0	1878
Minnesota	Duluth	67.9	25.1	78.0	1879	8.0	1878
Do	Saint Paul	79.0	24.9	87.0	1879	15.0	1878
Mississippi	Vicksburg	81.8	38.4	93.7	1884	34.0	1873
Missouri	Saint Louis	79.0	37.0	90.0	1879	45.0	1873
Montana	Fort Benton	78.2	21.8	87.0	1875	0.0	1881
Do	Helena	76.9	29.3	75.0	1880	10.0	1881
Nebraska	North Platte	83.0	18.0	89.0	1879	11.0	1878
Do	Omaha	75.5	30.2	87.0	1879	15.0	1878
Nevada	Winnemucca	82.3	20.8	84.0	1879	10.0	1878
New Hampshire	Mount Washington	54.2	9.6	59.0	1871	-3.0	1881
New Jersey	Atlantic City	73.9	33.6	83.0	1881, 1884	29.0	1879
Do	Sandy Hook	75.0	30.1	87.0	1881	33.0	1870
New Mexico	Santa Fé	74.5	27.0	85.0	1878	10.0	1880
New York	Buffalo	79.8	29.1	83.0	1879	24.7	1884
Do	New York City	74.1	34.3	84.3	1880	31.0	1876
North Carolina	Charlotte	73.8	37.8	91.9	1884	30.0	1879
Do	Wilmington			92.5	1884	34.0	1870
Ohio	Cincinnati	78.0	30.6	87.7	1884	27.0	1873
Do	Toledo	74.1	28.2	80.0	1872	25.0	1876
Oregon	Portland	82.2	34.5	79.0	1876	31.0	1877
Do	Roseburg	90.9	33.5	70.0	1877, 1880	22.5	1881
Pennsylvania	Philadelphia	78.2	34.0	87.0	1879, 1881	31.0	1873, 1876
Do	Pittsburg	81.8	45.5	91.1	1884	28.0	'73, '76, '78
Rhode Island	Block Island	68.9	35.3	75.4	1881	35.0	1870
Do	Newport			81.5	1879	30.0	1876
South Carolina	Charleston	81.9	46.0	93.0	1883	39.0	1873
Tennessee	Knoxville	75.8	32.4	84.0	1884	25.0	1870
Do	Nashville	77.8	33.2	91.9	1884	28.0	1873
Texas	Fort Davis	85.0	35.0	90.0	1881	30.0	1880
Do	Galveston	81.7	49.4	87.2	1884	45.0	1873
Utah	Salt Lake City	82.4	28.8	83.0	1876	22.0	1878
Vermont	Burlington			78.0	1879	22.0	1876
Virginia	Lynchburg	74.3	33.8	91.3	1884	28.0	1879
Do	Norfolk	81.6	42.8	89.0	1881, 1884	31.0	1870
Washington Ter.	Dayton	85.0	26.5	92.0	1880	19.0	1881
Do	Olympia	72.1	34.1	73.0	1880	23.0	1881
West Virginia	Morgantown			85.0	1879	25.0	1876
Wisconsin	La Crosse	73.0	28.0	84.0	1879, 1884	18.0	1873
Do	Milwaukee	69.5	31.1	83.1	1884	22.0	1878
Wyoming	Cheyenne	75.1	14.1	80.0	'73, '74, '79	-4.0	1878

ICE.

The formation of ice in the various states and territories occurred as follows:

- Alabama.**—Mobile, 23d.
Arkansas.—Fort Smith, 20th; Lead Hill, 20th, 21st, 22d.
Colorado.—Montrose, 12th, 21st, 25th, 26th, 27th, 31st; West Las Animas, 12th.
Connecticut.—Southington, 7th; Bethel, 31st.
Dakota.—Fort Sully and Bismarck, 6th; Fort Buford, 12th, 13th.
Idaho.—Boisé City, 11th.
Indiana.—Jeffersonville, 21st, 22d.
Iowa.—Des Moines and Oskaloosa, 4th; Independence, 5th,

21st; Dubuque and West Union, 6th; Muscatine, 6th, 8th; Cedar Rapids, 6th, 21st.

Kansas.—Concordia, 3d; Salina, 3d, 9th, 14th; Westmoreland, 6th, 21st, 29th; Dodge City, 13th; Fort Scott, 14th, 20th; Yates Centre, 21st; Topeka, 29th.

Maine.—Kent's Hill, 8th; Eastport, 12th; Bangor, 30th, 31st.

Massachusetts.—Heath and Taunton, 7th, 8th; Blue Hill, 7th, 31st.

Michigan.—Escanaba, 5th, 6th, 18th, 21st to 24th, 29th to 31st; Hudson, 20th; Manistique, 21st; Lansing, 23d, 24th; Detroit and Port Huron, 31st.

Minnesota.—Duluth, 4th, 8th; Saint Paul, 5th, 6th, 14th.

Missouri.—Lamar, 14th, 21st; Centerville, 21st.

Nebraska.—Genoa, 4th, 5th, 8th, 13th, 14th, 19th, 20th, 21st, 29th; Fairbury, 4th, 6th; Yutan, 4th, 6th, 8th, 14th, 20th, 21st, 22d, 29th; Valentine, 5th.

New Hampshire.—Contoocook, 12th.

New Mexico.—Santa Fé, 12th; Fort Stockton, 28th.

New York.—Albany, 8th; Humphrey, 8th, 16th, 24th, 25th, 26th; Rochester, 24th; Syracuse, 30th; Buffalo, 31st.

North Carolina.—Flat Rock, 5th, 14th, 20th to 25th.

Ohio.—North Lewisburg, 9th, 31st; Columbus, 24th; Cincinnati, 31st.

Pennsylvania.—Erie, 8th.

Tennessee.—Nashville, 21st, 22d, 24th; Austin, 22d; Ashwood, 22d, 24th.

Vermont.—Charlotte, 8th; Burlington, 12th.

Virginia.—Lynchburg: ice is reported to have been formed in the southwestern portion of Virginia during the night of the 6-7th; Brington, 22d.

Washington Territory.—Fort Spokane, 11th.

Wisconsin.—Embarras, 5th, 8th, 14th, 15th, 16th, 18th, 23d, 24th, 29th.

PRECIPITATION.

[Expressed in inches and hundredths.]

The distribution of rainfall over the United States and Canada for October, 1885, as determined from reports from more than eight hundred stations, is exhibited on chart iii.

In the following table are shown, for the several geographical districts, the normal October precipitation for a series of years; the average for October, 1885, and the excess or deficiency as compared with the normal:

Average precipitation for October.

Districts.	Average for October, Signal-Service observations.		Comparison of October, 1885, with the average for several years.
	For several years.	For 1885.	
	<i>Inches.</i>	<i>Inches</i>		Inches.
New England	4.03	5.49	+1.86
Middle Atlantic States.....	2.99	4.19	+1.20
South Atlantic States.....	4.22	6.18	+1.96
Florida Peninsula.....	5.29	5.07	-0.22
Eastern Gulf States.....	3.30	2.30	-1.00
Western Gulf States.....	4.06	1.59	-2.47
Rio Grande Valley.....	3.53	5.04	+1.51
Tennessee.....	3.24	4.20	+0.96
Ohio Valley.....	3.19	3.47	+0.28
Lower lake region.....	3.32	4.05	+0.73
Upper lake region.....	3.64	2.83	-0.81
Extreme northwest.....	2.00	0.58	-1.48
Upper Mississippi Valley.....	3.33	3.41	+0.08
Missouri Valley.....	2.25	2.09	-0.16
Northern slope.....	1.12	0.50	-0.56
Middle slope.....	1.60	1.08	-0.52
Southern slope.....	2.38	1.28	-1.10
Southern plateau.....	0.70	0.33	-0.43
Middle plateau.....	1.22	0.33	-0.89
Northern plateau.....	2.37	0.98	-1.39
North Pacific coast region.....	4.41	2.05	-2.35
Middle Pacific coast region.....	1.30	0.74	-0.56
South Pacific coast region.....	0.37	0.17	-0.20

The monthly precipitation has been below the average in all districts to the west of the Mississippi River, except in the lower part of the Missouri Valley and near the mouth of the Rio Grande River; it has also been deficient in the east Gulf states, portions of the Lake region and Ohio Valley, and at

certain stations on the middle Atlantic coast. The greatest deficiency occurred in the west Gulf states, where during the preceding month the precipitation was about double the average. In the Rocky Mountain districts and on the Pacific coast only about one-half of the average amount of rain fell.

In the states bordering on the Atlantic (except at certain stations on the coasts of New Jersey, Delaware, Maryland, and Virginia), in the lower Missouri and lower Ohio valleys, eastern Tennessee, and in Pennsylvania, the monthly precipitation has been above the average, the excess being greatest in the south Atlantic states and in New England.

The following are some of the greatest departures from the normal precipitation:

Above normal.	Inches.	Below normal.	Inches.
Lynchburg, Virginia	5.82	Palestine, Texas	3.83
Washington City	5.78	Galveston, Texas	3.55
Knoxville, Tennessee	4.93	Indianola, Texas	3.21
Saint Louis, Missouri	4.76	Portland, Oregon	3.20
Savannah, Georgia	3.98	Jacksonville, Florida	3.07
Erie, Pennsylvania	3.93	New Orleans, Louisiana	3.01
Mount Washington, New Hampshire	3.76	Moorhead, Minnesota	2.75
Baltimore, Maryland	3.65	Mobile, Alabama	2.65
Brownsville, Texas	3.60	Memphis, Tennessee	2.57
Hatteras, North Carolina	3.59	Vicksburg, Mississippi	2.51

In the tables of miscellaneous data will be found the monthly precipitation, and the departures from the normal, at the various stations of the Signal Service.

SNOW.

Snow fell in the various states and territories during the month, as follows:

California.—Fort Bidwell: on the 2d snow fell to a depth of two inches on the mountains west of this place.

Colorado.—Pike's Peak, 1st, 10th, 11th, 17th, 18th, 19th, 23d; Denver, 11th, 17th to 20th; Fort Lyon, 17th; West Las Animas, 18th, 20th.

Dakota.—Fort Totten, 4th, 7th, 19th, 20th, 26th, 27th, 28th; Bismarck and Fort Yates, 5th; Forts Bennett and Sully, 5th, 19th; Deadwood, 11th, 19th, 31st; Huron, 19th; Yankton, 20th; Fort Pembina, 19th, 29th; Fort Buford, 27th.

Illinois.—Sycamore, 31st.

Indiana.—Logansport, 20th, 28th, 31st; Fort Wayne, 31st.

Indian Territory.—Fort Supply, 18th.

Iowa.—Manchester and Oskaloosa, 4th, 20th; Burlington, Cedar Rapids, Keokuk, and Muscatine, 20th; Independence, 20th, 28th; Davenport, 20th, 31st; West Union, 20th, 28th, 30th, 31st; Cresco, 30th.

Kansas.—Westmoreland, 5th; Allison, 17th, 18th; Dodge City, 18th, 19th; Ninnescah, 19th.

Maine.—Bangor, 7th, 31st; Buckfield, 30th; Eastport, Gardiner, and Portland, 31st.

Massachusetts.—Fall River and Taunton, 31st.

Michigan.—Fort Brady, 3d, 4th; Mackinaw City, 3d, 4th, 7th, 28th; Marquette, 3d, 4th, 5th, 20th, 31st; Escanaba, 4th, 5th, 20th; Alpena, 6th; Grand Haven, 20th, 31st; Mottville, 21st, 31st; Port Huron, 30th; Lansing, 31st.

Minnesota.—Moorhead, 4th, 7th, 19th, 26th, 27th, 29th, 30th; Saint Paul, 4th, 19th, 20th, 30th, 31st; Northfield, 4th, 5th, 20th; Minneapolis, 4th, 20th, 31st; Saint Vincent, 6th, 19th, 20th, 29th, 31st; Duluth, 19th, 30th; Fort Snelling, 20th, 30th.

Montana.—Fort Ellis, 10th, 31st; Poplar River, 27th; Helena, 30th; Fort Maginnis, 31st.

Nebraska.—Fort Robinson, 11th, 17th, 31st; Valentine, 11th, 19th; North Platte, 19th; Omaha and Tecumseh, 20th.

New Hampshire.—Mount Washington, 6th, 29th, 30th.

New Jersey.—Dover, 30th; Atlantic City, 31st.

New Mexico.—Santa Fé, 9th.

New York.—North Volney, 5th, 30th; Syracuse, 6th, 7th, 30th; Buffalo, 6th, 30th; Ithaca and Menand Station, 8th, 30th; Albany, Fort Columbus, Madison Barracks, Oswego, Rochester, and West Point, 30th.

Ohio.—Hiram, 2d, 3d, 4th, 30th; Garrettsville, 5th, 30th; Cleveland, 6th; Toledo, 31st.

Oregon.—Lakeview, 22d.

Pennsylvania.—Pittsburg, 5th, 31st; Erie, 8th, 30th; Tidoute, 20th, 30th, 31st; Troy, 21st, 22d, 26th; Wysox, 29th, 30th.

Rhode Island.—Narragansett Pier and Point Judith, 31st.

Utah.—Salt Lake City, 10th, 31st.

Vermont.—Burlington, 7th, 30th; Charlotte, 30th.

Wisconsin.—Embarras, 19th, 20th, 21st, 27th, 28th, 29th; Neillsville, 19th, 20th, 31st; Milwaukee, 19th; Evansville, 20th, La Crosse and Wausau, 20th, 31st; Madison, 31st.

Wyoming.—Cheyenne, 3d, 11th, 18th, 31st; Fort Fred Steele, 10th, 11th, 30th, 31st; Fort Bridger, 10th; Fort Laramie, 11th.

MONTHLY SNOWFALLS.

[Expressed in inches and tenths.]

The following stations report monthly snowfalls of one inch or more:

Colorado.—Pike's Peak, 15; West Las Animas, 2.4.

Dakota.—Deadwood, 6.4; Fort Totten, 5.7; Fort Bennett, 1.5.

Illinois.—Sycamore, 3.

Iowa.—West Union, 1.2.

Kansas.—Allison, 2.2.

Michigan.—Marquette, 12; Lansing, 3; Escanaba, 2.6; Mottville, 2.

Minnesota.—Moorhead, 1.9; Duluth, 1.4; Saint Vincent, 1.2.

Nebraska.—North Platte, 2.

New Brunswick.—Parker's Ridge and Saint John, 1.

New Hampshire.—Mount Washington, 2.

New York.—Humphrey, 2.9; Rochester, 1.7; North Volney, 1.

Vermont.—Stowe, 5; Burlington, 3; Newport, 1.5; Lunenburg, 1.

Wisconsin.—Embarras, 7.2; Wausau, 3.5; Neillsville, 2.5.

Wyoming.—Fort Bridger, 3.4.

DEPTH OF UNMELTED SNOW ON GROUND AT END OF MONTH.

[Expressed in inches and tenths.]

Colorado.—Pike's Peak, 6.

Dakota.—Deadwood, 1.1.

Illinois.—Sycamore, 3.

Indiana.—Fort Wayne, 0.2.

Maine.—Eastport, 0.7.

Minnesota.—Saint Vincent, 0.5.

New York.—North Volney and Rochester, trace.

Vermont.—Newport, 1; Stowe, 0.1; Burlington, trace.

Wisconsin.—Embarras, 2; Wausau, trace.

HAIL.

Buffalo, New York: During the morning of the 5th a severe hail storm passed over this city in a direction from southwest to northeast. It began at 9.45 and lasted ten minutes, the hail-stones measuring about one-fourth inch in diameter.

Fort Verde, Arizona: at 8.30 p. m. (local time) on the 16th a violent hail storm, lasting only a few minutes, occurred at this place. The ground was covered with hail-stones, varying from one-fourth to three-fourths of an inch in diameter.

Abilene, Texas: during a thunder-storm on the morning of the 24th there was a heavy fall of hail, lasting from 9.25 to 9.40. The hail fell in sufficient quantity to remain on the ground two hours after the storm, the largest of the hail-stones measuring three-fourths of an inch in diameter.

Hail also occurred in the various states and territories, as follows:

Arizona.—San Carlos, 9th; Fort Verde, 16th.

Connecticut.—Southington, 2d.

Dakota.—Fort Pembina, 27th.

Illinois.—Sycamore, 20th.

Indiana.—Logansport, 20th.

Iowa.—Oskaloosa, 4th; Monticello, 20th.

Kansas.—West Leavenworth, 11th; Westmoreland, 18th, 27th.

Maine.—Bangor, 7th; Machias, 14th.

Table of excessive and greatest monthly precipitation for October, 1885.

Station.	Specially heavy.		Largest monthly.	Station.	Specially heavy.		Largest monthly.
	Date.	Amt.			Date.	Amt.	
Alabama.				New York—Cont'd			
Birmingham.....	1, 2	2.14		Mountainville.....			6.79
Lafayette.....	27, 28	2.32		Auburn.....	20, 21	2.11	
Connecticut.				Factoryville.....	20, 21	3.20	
New Haven.....	3	2.20		Ithaca.....	20, 21	3.23	
Dist. of Columbia.				Plattsburg B'ks.....	21, 22	2.25	
Receiv'g Reservoir	3	2.22	10.88	North Carolina.			
Do.....	13	2.12		Flat Rock.....	1	2.00	12.85
Do.....	21, 22	2.06		Do.....	12	4.11	
Do.....	29, 30	3.35		Do.....	28, 29	5.26	
Distrib. Reservoir	3	2.08	9.57	Hatteras.....	28, 29	3.47	10.28
Do.....	21	2.10		Lenoir.....	11, 12	2.50	9.50
Do.....	29, 30	2.72		Do.....	28, 29	3.50	
West Washington	29, 30	3.44	8.77	Asheville.....			8.30
Washington City.....	29, 30	3.19	8.69	New River Inlet*.....	12	2.98	* 7.59
Florida.				Do.....	29	2.87	
Sanford.....	10	6.09	7.48	Statesville.....	11, 12	3.64	7.43
Merritt's Island.....	9, 10	3.88		Do.....	20, 21	2.56	
Key West.....	9, 10	2.57		Smithville.....	11, 12	4.60	7.18
Cedar Keys.....	10, 11	2.83		Charlotte.....	12	2.82	6.64
Jacksonville.....	10, 11	3.14		Do.....	20, 21	2.23	
Pensacola.....	27, 28	2.24		Lincolnton.....	20	2.50	
Archer.....	10, 11	2.23		Weldon.....	12	2.00	
Mayport.....	10, 11	4.98		Do.....	28, 29	2.37	
Saint Augustine.....	10, 11, 12	2.88		Fort Macon.....	12	2.03	
Fernandina.....	11, 12	4.50		Ohio.			
Live Oak.....	11, 12	2.66		Marietta.....	12	2.03	
Georgia.				McConnellsville.....	12, 13	2.30	
Rabun Gap.....			11.20	Quaker City.....	12, 13	2.56	
Ellerslie.....			10.50	New Alexandria.....	13, 14	2.79	
Jesup.....	11, 12	9.50	10.02	Canton.....	12, 13	2.30	
Dalton.....	1, 2	3.62	8.93	Youngstown.....	13, 14	3.26	
Do.....	28, 29	3.61		Warren.....	12, 13	2.95	
Toccoa.....	11, 12	2.81	8.38	Jefferson.....	12, 13	2.30	
Savannah.....	11, 12	5.48	7.07	Hiram.....	12, 13, 14	3.19	
Walthourville.....			7.00	Salem.....	12, 13	2.25	
Dahlonega.....			6.75	Ellsworth.....	12, 13	3.32	
Union Point.....	11, 12	2.25	6.32	Hudson.....	12, 13	2.10	
Gainesville.....			6.20	Pennsylvania.			
Milledgeville.....	11, 12	2.00		Erie.....	13, 14	3.54	8.17
Camak.....	11, 12	2.00		Blooming Grove.....	20	3.10	7.70
Washington.....	11, 12	2.30		Do.....	29, 30	2.10	
Waynesborough.....	11, 12	2.10		Wellsborough.....	21, 22	4.80	7.50
West Point.....	1, 2	2.49		Wysox.....	20, 21	3.59	6.83
Newman.....	28, 29	2.34		West Chester.....	13	2.21	6.25
Griffin.....	28, 29	2.72		Mahanoy Plane.....	21	2.60	
Columbus.....	1, 2, 3	3.64		Drifton.....	21	2.21	
Way Cross.....	11, 12	3.00		Troy.....	21	3.17	
Illinois.				Pittsburg.....	12, 13	2.11	
Springfield.....	12, 13	2.03	6.30	Rhode Island.			
Do.....	18, 19	2.17		Block Island.....	13, 14	2.79	
Collinsville.....	19	2.50		South Carolina.			
Mattoon.....	18, 19	2.38		Charleston.....	11, 12	5.66	8.09
Chicago.....	19	2.22		Pacolet.....	11, 12	3.32	7.50
Windsor.....	19	2.14		Greenville.....	1	2.22	6.78
Indiana.				Batesburg.....	11, 12	2.50	6.14
Fort Wayne.....	18, 19	2.10		Stateburg.....	11, 12	2.32	
Terre Haute.....	2, 3	2.36		Allendale.....	11, 12	2.60	
Iowa.				Blackville.....	11, 12	2.39	
Logan.....	11, 12	2.40		Chester.....	12	2.10	
Kansas.				Columbus.....	11, 12	2.12	
W. Leavenworth.....	11	2.10		Greenwood.....	12	2.44	
Leavenworth.....	11, 12	2.20		Spartanburg.....	11, 12	2.13	
Concordia.....	18, 19	2.15		Tennessee.			
Louisiana.				Knoxville.....	28, 29	3.42	7.86
Shreveport.....	25, 26	3.81		Andersonville.....	28, 29	2.82	7.03
Coushatta.....	25, 26	2.16		Grief.....	28, 29	2.44	6.32
Maine.				Greenville.....	12	2.00	
Eastport.....	29, 30	2.74		Jonesborough.....	28, 29	2.89	
Maryland.				Manchester.....	28	2.01	
Woodstock.....	2, 3	3.10	10.23	Beech Grove.....	28, 29	2.26	
Do.....	12, 13	2.50		Texas.			
Do.....	29, 30	2.15		Longview.....	18	3.97	10.23
Great Falls.....	13	2.13	8.23	Do.....	25, 26	6.10	
Do.....	30	2.02		Fort Brown.....	10	5.65	9.75
Fallston.....	21	2.40	7.07	Brownsville.....	8, 9	5.31	8.29
Baltimore.....	29, 30	2.07	6.51	Weimar.....	19	2.00	
McDonough.....			6.38	Vermont.			
Fort McHenry.....	29, 30	2.08		Stowe.....			7.69
Massachusetts.				Charlotte.....	21, 22	3.00	7.20
Deerfield.....			6.48	Do.....	30, 31	2.20	
Fall River.....	13, 14	2.05		Newport.....	21	3.11	6.41
Michigan.				Burlington.....	21, 22	2.40	
Grand Haven.....	19	2.27		Lunenburg.....	21, 22	2.06	
Mississippi.				Strafford.....	21	2.60	
Macon.....	27, 28	2.51		Virginia.			
Aberdeen.....	2	2.09		Dale Enterprise.....	12	3.14	12.60
Missouri.				Do.....	20, 21	2.88	
Saint Louis.....	12, 13	2.15	7.51	Do.....	23, 29	4.75	
Do.....	18, 19	3.27		Variety Mills.....	12, 13	4.00	10.76
Conception.....	11, 12	2.18		Do.....	2, 21	3.10	
Nebraska.				Do.....	28, 29	4.02	
Harvard.....	10	2.50		Fort Myer.....	21	2.08	9.72
New Hampshire.				Do.....	29, 30	3.53	
Mt. Washington.....	3, 4	3.71	11.11	Lynchburg.....	12	2.31	8.67
Do.....	21, 22	3.08		Do.....	20, 21	2.31	
Woodstock.....	21, 22	2.56		Do.....	28, 29	3.23	
New Jersey.				Christiansburg.....	27, 28	2.00	7.22
Dover.....	20, 21	2.15		Accotink.....	30	2.17	6.97
New York.				Blacksburg.....	29	2.30	6.64
White Plains.....	7	2.40	8.40	Snowville.....			6.20
Do.....	14	2.20		Washington Ter.			
Setauket.....	3	2.59	6.35	Neah Bay.....	27 to 31	5.10	7.95
Buffalo.....	13, 14	3.71	6.19	Tatoosh Island.....	27, 28	2.26	7.51

* Record for 17 days.

Michigan.—Birmingham, 4th; East Saginaw, 5th, 6th; Pentwater, 19th; Grand Haven, 20th, 21st.

Nebraska.—Tecumseh, 12th; North Platte, 18th.

New York.—Oswego, 5th, 30th.

Ohio.—Toledo, Garrettsville, and Napoleon, 4th; North Lewisburg, 6th; Wauseon, 22d; Jacksonburg, 31st.

Oregon.—Portland, 9th; Lakeview and Ashland, 22d.

Pennsylvania.—Tidioute, 4th; Pittsburg and Erie, 6th.

Rhode Island.—Block Island and Narragansett Pier, 3d.

Virginia.—Dale Enterprise, 30th.

Washington Territory.—Pysht, 29th.

Wisconsin.—Embarras, 28th.

Wyoming.—Fort Bridger, 30th.

DEVIATIONS FROM AVERAGE PRECIPITATION.

The following table shows, for certain stations, as reported by voluntary observers, the average precipitation for the month of October for a series of years, the precipitation for October, 1885, and the departures from the average:

Station.	County.	Average precipitation for Oct.	Number of years.	Precipitation for October, 1885.	Departure.
		Inches.		Inches.	Inches.
Arkansas.					
Lead Hill.....	Boone.....	8.12	4	1.22	+6.90
California.					
Sacramento.....	Sacramento.....	0.84	10	Inap'able	-0.84
Connecticut.					
Hartford.....	Hartford.....	3.20	13	4.48	+1.28
Middletown.....	Middlesex.....	3.90	27	4.78	+0.88
Wallingford.....	New Haven.....	4.05	27	5.59	+1.54
Dakota.					
Webster.....	Day.....	6.44	3	0.79	-5.65
Illinois.					
Anna.....	Union.....	4.05	10	3.43	-0.62
Collinsville.....	Madison.....	3.05		5.52	+2.47
Mattoon.....	Coles.....	5.69	5	4.00	-1.69
Riley.....	McHenry.....	2.61	25	2.57	-0.04
Sycamore.....	De Kalb.....	5.25	4	4.05	-1.60
Indiana.					
Lafayette.....	Tippecanoe.....	3.38	6	2.96	-0.42
Logansport.....	Cass.....	2.78	20	3.68	+0.90
Mauzy.....	Rush.....	3.57		2.89	-0.68
Spiceland.....	Henry.....	2.90	25	1.90	-1.00
Vevay.....	Switzerland.....	2.65	21	2.62	-0.03
Kansas.					
Independence.....	Montgomery.....	3.11	13	1.79	-1.32
Lawrence.....	Douglas.....	2.89	18	3.33	+0.43
Wellington.....	Sumner.....	3.73	7	2.41	-1.32
Yates Centre.....	Woodson.....	4.00	5	3.00	-1.00
Maine.					
Gardiner.....	Kennebec.....	4.45	47	3.93	-0.52
Maryland.					
Fallston.....	Harford.....	3.21	15	7.07	+3.86
Massachusetts.					
Amherst.....	Hampshire.....	3.79	51	4.11	+0.32
Cambridge.....	Middlesex.....	3.40	45	5.68	+2.28
Fitchburg.....	Worcester.....	3.93	21	3.41	-0.52
Lake Cochituate.....	Middlesex.....	4.20	34	5.31	+1.11
Lowell.....	Middlesex.....	3.65	60	4.41	+0.83
New Bedford.....	Bristol.....	3.80	73	4.04	+0.24
Springfield.....	Hampden.....	4.19	35	4.89	+0.70
Somerset.....	Bristol.....	3.85	15	4.34	+0.49
Taunton.....	Bristol.....	3.01	11	3.70	+0.69
Williamstown.....	Berkshire.....	2.79	17	3.12	+0.33
Worcester.....	Worcester.....	4.07	47	4.81	+0.74
Nevada.					
Carson City.....	Ormsby.....	0.54	6	0.12	-0.42
New Brunswick.					
Saint John.....	Saint John.....	4.62	25	6.78	+2.16
New Hampshire.					
Antrim.....	Hillsborough.....	3.49	12	3.90	+0.41
Concord.....	Merrimac.....	3.91	30	3.63	-0.28
Hanover.....	Grafton.....	2.78	20	2.87	+0.09
New Jersey.					
South Orange.....	Essex.....	3.54	16	4.35	+0.81
New York.					
North Volney.....	Oswego.....	3.62	14	3.70	+0.08
Palermo.....	Oswego.....	3.52	32	3.12	-0.40
Ohio.					
Wauseon.....	Fulton.....	3.02	13	3.03	+0.01
Pennsylvania.					
Dyberry.....	Wayne.....	3.22	15	3.52	+0.30
Rhode Island.					
Providence.....	Providence.....	3.81	54	5.51	+1.70
Vermont.					
Lunenburg.....	Essex.....	3.61	38	4.51	+0.90
Newport.....	Orleans.....	4.30	10	6.41	+2.11
Strafford.....	Orange.....	3.30	11	5.90	+2.60
Woodstock.....	Windsor.....	3.78	17	4.70	+0.92
Virginia.					
Bird's Nest.....	Northampton.....	3.26	16	2.35	-0.91
Dale Enterprise.....	Rockingham.....	3.81	3	12.60	+8.79
Variety Mills.....	Nelson.....	2.51	7	10.76	+8.25
West Virginia.					
Helvetia.....	Randolph.....	8.32	9	5.80	-2.52
Wisconsin.					
Wausau.....	Marathon.....	3.04	6	0.95	-2.09

* From the "Bulletin of the New England Meteorological Society."

SLEET.

Pike's Peak, Colorado, 1st.
 Fort Buford, Dakota, 26th.
 Chicago, Illinois, 30th.
 Dubuque, Iowa, 20th.
 Des Moines, Iowa, 27th.
 Detroit, Michigan, 4th.
 Grand Haven, Michigan, 4th, 20th.
 Escanaba, Michigan, 19th, 20th, 31st.
 Saint Vincent, Minnesota, 30th.
 Fort Robinson, Nebraska, 17th.
 Crete, Nebraska, 18th.
 North Platte, Nebraska, 18th.
 Mount Washington, New Hampshire, 4th, 5th, 6th, 13th, 30th.
 Oswego, New York, 7th.
 Rochester, New York, 30th.
 Tiffin, Ohio, 6th.
 North Lewisburg, Ohio, 6th.
 Garrettsville, Ohio, 30th.
 Wauseon, Ohio, 31st.
 Yellow Springs, Ohio, 31st.
 Erie, Pennsylvania, 21st.
 Charlotte, Vermont, 30th.
 La Crosse, Wisconsin, 31st.

TEMPERATURE OF WATER.

The following table shows the highest and lowest temperatures of water observed at the several stations; the monthly ranges of water temperature; the average depth at which the observations were made; and the mean temperature of the air:

Temperature of water for October, 1885.

Station.	Temperature at bottom.		Range.	Average depth, feet and tenths.	Mean temperature of the air at station.
	Max.	Min.			
Atlantic City, New Jersey.....	66.0	54.1	11.1	11.4	55.8
Alpena, Michigan.....	60.3	37.0	23.3	12.6	42.5
Augusta, Georgia.....	68.5	58.0	10.5	10.0	59.8
Baltimore, Maryland.....	68.4	59.0	9.4	10.6	55.4
Block Island, Rhode Island.....	61.2	53.3	7.9	8.4	54.5
Boston, Massachusetts.....	57.8	50.1	7.7	20.3	51.0
Buffalo, New York.....	60.0	44.9	15.1	9.7	49.2
Canby, Fort, Washington Territory.....	63.1	53.9	9.2	15.7	55.1
Cedar Keys, Florida.....	82.0	65.6	16.4	8.4	68.8
Charleston, South Carolina.....	74.1	62.2	11.9	38.5	65.2
Chicago, Illinois.....	66.6	38.9	27.7	8.8	51.1
Chincoteague, Virginia.....	70.3	54.3	16.0	3.6	58.8
Cleveland, Ohio.....	64.0	51.1	12.9	14.0	50.1
Detroit, Michigan.....	64.9	46.5	18.4	25.8	50.0
Duluth, Minnesota.....	52.2	43.9	8.3	10.7	41.7
Eastport, Maine.....	51.7	49.4	2.3	17.2	47.9
Escanaba, Michigan.....	59.1	46.8	12.3	19.6	43.1
Galveston, Texas.....	79.5	63.0	16.5	12.8	69.7
Grand Haven, Michigan.....	66.3	44.7	21.6	19.0	45.8
Indianola, Texas.....	82.5	59.6	22.9	8.9	69.8
Jacksonville, Florida.....	79.2	66.2	13.0	18.0	67.6
Key West, Florida.....	85.1	75.0	10.1	17.8	77.8
Mackinaw City, Michigan.....	50.6	43.3	7.3	10.0	43.9
Macon, Fort, North Carolina.....	74.8	63.0	11.8	13.6	63.5
Marquette, Michigan.....	54.5	43.1	11.4	12.6	41.6
Milwaukee, Wisconsin.....	59.8	49.9	9.9	8.0	46.4
Mobile, Alabama.....	77.7	61.9	15.8	15.9	62.9
New Haven, Connecticut.....	66.4	52.6	13.8	16.6	51.6
New London, Connecticut.....	65.0	57.0	8.0	18.8	54.5
New York City.....	71.7	56.0	15.7	16.2	60.4
Norfolk, Virginia.....	81.2	65.0	16.2	17.4	64.7
Pensacola, Florida.....	53.1	49.3	3.8	16.9	47.5
Portland, Maine.....	65.0	53.4	11.6	49.5	50.0
Portland, Oregon.....	66.6	47.0	19.6	17.5	50.5
Sandusky, Ohio.....	68.2	55.4	12.8	2.3	55.3
Sandy Hook, New Jersey.....	61.2	58.0	3.2	38.4	59.5
San Francisco, California.....	71.6	60.3	11.1	11.3	64.5
Savannah, Georgia.....	72.6	61.5	11.1	11.0	62.1
Smithville, North Carolina.....	67.4	47.9	19.5	13.5	50.3
Toledo, Ohio.....					
Wilmington, North Carolina.....					

COTTON REGION REPORTS.

The temperature in all districts was decidedly below the normal. The rainfall was largely in excess in the eastern districts, while marked deficiencies occurred in the western districts. The report from the district of Wilmington has not been received.

The following table shows the means of the maximum and

minimum temperatures, and the average rainfall for the several cotton districts, for the month of October, 1885, together with the averages for the three preceding years:

Temperature and rainfall data for the cotton districts, October, 1885.

Districts.	Rainfall.			Temperature.						Extremes for Oct., 1885.	
	Average for Oct. of three preceding years.	Average for Oct., 1885.	Departures.	Maximum.			Minimum.				
				Mean for Oct. of three preceding years.	Mean for Oct., 1885.	Departures.	Mean for Oct. of three preceding years.	Mean for Oct., 1885.	Departures.		
	Inch.	Inch.	Inch.	°	°	°	°	°	°	Max.	Min.
New Orleans...	2.74	1.23	-1.49	82.7	73.6	-9.1	62.3	50.3	-12.0	93	30
Savannah...	1.95	3.36	+1.61	82.8	74.3	-8.5	61.0	55.1	-5.9	92	37
Charleston...	1.89	4.83	+2.94	79.1	72.0	-7.1	55.9	51.8	-4.1	85	33
Atlanta...	1.66	5.66	+4.00	77.9	67.4	-10.5	56.3	47.9	-8.4	79	29
Wilmington...	2.01			70.9			54.6				
Memphis...	2.83	2.09	-0.74	77.6	68.6	-9.0	54.5	46.1	-8.4	85	20
Galveston "	4.14	1.65	-2.44	83.1	77.2	-5.9	61.9	54.4	-7.5	90	27
Vicksburg...	3.59	1.19	-2.40	80.7	72.2	-8.5	58.3	48.8	-9.5	82	31
Montgomery...	1.58	1.67	+0.09	81.8	71.4	-10.4	57.9	49.8	+8.1	86	28
Augusta...	1.51	4.91	+3.40	79.6	69.0	-10.6	56.8	48.9	-7.9	83	22
Little Rock...	2.37	1.01	-1.36	77.5	72.0	-5.5	52.5	45.7	-6.8	90	10
Mobile...	2.15	2.06	-0.09	82.0	72.9	-9.1	58.5	49.8	-8.7	85	21

* Averages for two years only.

WINDS.

The most frequent directions of the wind during October, 1885, are shown on chart ii by arrows flying with the wind; they are also given in the tables of miscellaneous meteorological data. In the extreme northwest, upper Mississippi and Missouri valleys, and in the Gulf States they were mostly from the north and northwest; in the south Atlantic states they were northeasterly; in the Ohio Valley, lower lake region, and in New England they were from southeast to southwest; in the middle Atlantic states, upper lake region, Rocky Mountain districts, and on the Pacific coast they were variable.

HIGH WINDS.

[In miles per hour.]

On the summit of Mount Washington, New Hampshire, winds of fifty or more miles per hour occurred during the month as follows: 94, se., 14th; 90, s., 21st; 81, se., 13th; 77, w., 4th; 72, sw., 20th; 68, w., 11th; 60, n., 5th; 60, se., 3d.; 60, sw., 22d; 60, ne., 30th; 59, w., 10th; 59, sw., 29th; 56, se., 2d; 52, sw., 19th; 50, w., 18th.

Other stations reporting wind-velocities of fifty or more miles per hour are as follows:

Pike's Peak, Colorado, 60, w., 10th; 58, nw., 4th; 56, nw., 27th; 54, w., 14th; 52, nw., 30th; 52, nw., 29th.

Valentine, Nebraska, 52, nw., 4th.

Sandy Hook, New Jersey, 60, e., 13th; 50, e., 29th.

Cape May, New Jersey, 52, w., 4th.

Barnegat City, New Jersey, 52, e., 29th.

Kitty Hawk, North Carolina, 76, se., 29th; 53, se., 12th.

Fort Macon, North Carolina, 56, se., 12th.

Sandusky, Ohio, 54, n., 29th.

Cape Henry, Virginia, 52, e., 13th.

Fort Canby, Washington Territory, 56, se., 27th; 54, s., 29th; 53, s., 25th.

LOCAL STORMS AND TORNADOES.

Block Island, Rhode Island, 3d: a violent thunder-storm occurred at about 9.30 a. m., accompanied by hail and wind-squalls, of short duration, of from forty to fifty miles per hour. Considerable damage was done to out-buildings, fences, etc.

Narragansett Pier, Rhode Island, 3d: a heavy thunder-storm, accompanied by high, variable winds and hail, began at 9.35 a. m. and continued for about one hour. The high winds caused considerable damage, and a large number of telephones were destroyed or damaged by lightning.

Westwood, Bergen county, New Jersey: a tornado occurred at this place at 1.15 p. m. on the 4th. The cloud was funnel-shaped, and moved in a northeasterly direction. The path of the tornado was about six miles in length and its width about

five hundred feet, the shortest time in passing a given point being ten seconds. Five buildings were destroyed, entailing a loss estimated at \$25,000.

Windsor, Alachua county, Florida: a tornado occurred at this place at 12 m. on the 11th. It moved in an east-northeasterly direction at the rate of forty miles per hour, destroying four buildings, and injuring several others during its passage.

Lane Park, Sumter county, Florida: a tornado occurred a short distance east of this place on the morning of the 11th. The tornado moved in a northeasterly direction, leaving a well-marked path, about one hundred yards wide, through the timber; the largest pine and cypress trees were torn up by the roots.

Captain Charles Haley, of the schooner "Genevieve," at Philadelphia, November 9th, from Charleston, South Carolina, reports the following:

On October 29th, at 10 a. m., when about thirty miles south of Frying Pan Lightship, was struck by a tornado aloft, which carried away the main and mizzen masts about twenty-feet below the cross-trees. The weather at the time was moderate, and the wind on deck did not exceed a five-knot breeze, the only indications of a change being a rain-squall from the northwest. Four hours after the tornado we had a gale from the west which continued twenty hours.

Philadelphia, Pennsylvania, 29th: a heavy thunder-storm began at 6.35 p. m., and continued for one hour. The peals of thunder, and the electrical display, were very unusual. Considerable damage was done by lightning in this city and in Camden, New Jersey. All of the electric lights were extinguished, and telegraphic communication was rendered difficult.

NAVIGATION.

STAGE OF WATER IN RIVERS.

In the following table are shown the danger-points at the various river stations; the highest and lowest stages for October, 1885, with the dates of occurrence, and the monthly ranges:

Heights of rivers above low-water mark, October, 1885.

[Expressed in feet and tenths.]

Stations.	Danger-point on gauge.	Highest water.		Lowest water.		Monthly range.
		Date.	Height.	Date.	Height.	
<i>Red River:</i>						
Shreveport, Louisiana.....	29 9	1, 2, 3	3 2	24	0 7	2 5
<i>Arkansas River:</i>						
Fort Smith, Arkansas.....	22 0	8	4 2	16, 18	2 7	1 5
Little Rock, Arkansas.....	23 0	1	4 8	26 to 30	3 3	1 5
<i>Missouri River:</i>						
Yankton, Dakota.....	24 0	1, 2, 3	14 0	29, 30, 31	11 6	2 4
Omaha, Nebraska.....	18 0	1, 2, 3	6 5	9, 10, 11, 13	5 7	0 8
Leavenworth, Kansas.....	20 0	19	7 3	10, 11, 12	6 5	0 8
<i>Mississippi River:</i>						
Saint Paul, Minnesota.....	14 5	1, 13, 16, 17, 19	3 4	25	2 9	0 5
La Crosse, Wisconsin.....	24 0	1, 2	4 8	30, 31	3 7	1 1
Dubuque, Iowa.....	16 0	1	5 6	15 to 19	3 8	1 8
Davenport, Iowa.....	15 0	1, 2	4 7	18	2 8	1 9
Keokuk, Iowa.....	14 0	1	6 3	15 to 18	3 9	2 4
Saint Louis, Missouri.....	32 0	1	12 5	18	8 8	3 7
Cairo, Illinois.....	40 0	28	15 0	20	8 4	6 6
Memphis, Tennessee.....	34 0	1	9 5	22	5 0	4 4
Vicksburg, Mississippi.....	41 0	1	18 2	26, 27	4 9	13 3
New Orleans, Louisiana*.....	-3 0	1	-10 1	25, 29, 30	-13 7	3 0
<i>Ohio River:</i>						
Pittsburg, Pennsylvania.....	22 0	16	7 5	2, 3, 4	0 8	6 7
Cincinnati, Ohio.....	50 0	20	17 1	11, 12	3 9	13 2
Louisville, Kentucky.....	25 0	22, 23	7 7	11	2 7	5 0
<i>Cumberland River:</i>						
Nashville, Tennessee.....	40 0	31	5 2	1	0 9	4 3
<i>Tennessee River:</i>						
Chattanooga, Tennessee.....	33 0	31	15 5	12	2 0	13 5
<i>Monongahela River:</i>						
Pittsburg, Pennsylvania.....	29 0	16	7 5	2, 3, 4	0 8	6 7
<i>Savannah River:</i>						
Augusta, Georgia.....	32 0	14	17 8	11	6 1	11 7
<i>Mobile River:</i>						
Mobile, Alabama.....	19	16 8	4	15 2	1 6	
<i>Sacramento River:</i>						
Red Bluff, California.....	1 to 21	0 4	22 to 31	0 3	0 1	
Sacramento, California.....	19 to 24	7 7	1 to 17, 26 to 31	7 5	0 2	
<i>Willamette River:</i>						
Portland, Oregon.....	29	3 5	20	0 3	3 2	
<i>Colorado River:</i>						
Yuma, Arizona.....						

* Below high-water mark of 1874 and 1883.

The observer at Nashville, Tennessee, reports that the first

steamer of the season from the Ohio River arrived at that place on the 28th. At the end of the month navigation for the fall season was resumed.

The Tennessee River at Chattanooga rose about ten feet during the last two days of the month.

FLOODS.

Sanford, Florida: more than six inches of rain fell at this place on the 10th, flooding the greater part of the town and the lowlands in the vicinity. Considerable damage was done to railroads, highways, bridges, etc. Lake Monroe rose three feet during the storm.

Savannah, Georgia: the high easterly and northeasterly winds during the 11th caused a remarkably high tide, which swept over the adjacent lowlands, causing great damage to the rice crop. The water in the Savannah River reached a stage eighteen inches higher than at any time since the flood of August, 1881.

Reading, Pennsylvania, 17th: the recent heavy rains caused a break in the Schuylkill Canal, near Birdsborough, and resulted in the flooding of the adjacent farms, some of the fields being covered to a depth of three feet.

Burlington, Vermont: the heavy rain on the 21st caused a rise of five feet in the Winooski River. A temporary bridge, connecting Burlington and Winooski, was washed away, entailing a loss of \$1,000.

Sharon, Mercer county, Pennsylvania, 23d: the recent heavy rains caused the Shenango River to rise to an unusual height, causing a large amount of damage to the property of the Sharon water company.

Harrisonburg, Rockingham county, Virginia: the heaviest rainfall for many years occurred on the 29th and 30th. All streams were much swollen, and several washouts occurred along the Valley Branch of the Baltimore and Ohio railroad.

Richmond, Virginia, 30th: a high stage of water occurred in the James River on this date, submerging wharves in the lower part of the city; no serious damage resulted.

Lynchburg, Virginia: the remarkably heavy rainfall of the 28th and 29th caused destructive freshets in the streams in this part of the state. Much damage was done to railroad tracks and bridges. Reports from Fredericksburg state the flood in the Rappahannock River at that place caused damage estimated at \$10,000.

Charleston, West Virginia: the Kanawha River rose rapidly during the morning of the 31st, sweeping away a large number of loaded barges along the river in this vicinity, causing the loss of about 500,000 bushels of coal. The losses are estimated at \$150,000.

HIGH TIDES.

Smithville, North Carolina: the unusually high tide on the 12th submerged the entire water-front of this place; a few stores were flooded.

Wilmington, North Carolina: the highest tide for ten years occurred on the 12th.

Washington City: the tide in the Potomac was unusually high between 7 and 8 a. m. on the 12th.

Cape May, New Jersey: an unusually high sea caused considerable damage along the water-front at this place on the 25th.

High tides were also reported, as follows:

New River Inlet, North Carolina, 10th, 11th, 12th, 29th, 30th, 31st.

Cedar Keys, Florida, 11th.

Fort Macon, North Carolina, 12th, 27th, 28th, 29th.

Chincoteague, Virginia, 12th, 13th.

Ocean City, Maryland, 12th, 13th, 29th.

New York City, 13th.

VERIFICATIONS.

INDICATIONS.

The percentages of indications verified for September, 1885, (which were not published in the REVIEW for that month), and those for October, 1885, will be published hereafter.

The percentages of verifications of special predictions for certain localities are, as follows:

Omaha, Nebraska (twenty-seven days), 89.35; Alabama (twenty-seven days), 85.65; Tennessee (twenty-seven days), 88.00; Georgia, twenty-seven days, 88.94; Baltimore, Maryland, 76.61; Washington City, 77.82; Erie, Pennsylvania, 72.58; Boston, Massachusetts, 77.82; New Haven, Connecticut, 76.21; Portland, Maine, 77.42; Albany, New York, 76.61; Pittsburg, Pennsylvania, 72.58; Cincinnati, Ohio, 70.16; Louisville, Kentucky, 77.82; Columbus, Ohio, 70.97; Cleveland, Ohio, 73.39; Indianapolis, Indiana, 75.81; Oswego, New York, 72.98; Rochester, New York, 73.79; Buffalo, New York, 80.65; Milwaukee, Wisconsin, 70.56; Chicago, Illinois, 66.53; Detroit, Michigan, 77.92; Toledo, Ohio, 77.82; Sandusky, Ohio, 79.03; Cairo, Illinois, 74.60; Saint Louis, Missouri, 70.16; Memphis, Tennessee, 85.89; Shreveport, Louisiana, 85.48.

CAUTIONARY SIGNALS.

During October, 1885, one hundred and twenty-seven cautionary signals were ordered. Of these, one hundred and nine, or 85.83 per cent., were justified by winds of twenty-five miles or more per hour, at or within one hundred miles of the station. Twenty-five cautionary off-shore signals were ordered, of which number, twenty-two, or 88.00 per cent., were fully justified both as to direction and velocity; and all, or 100 per cent., were justified as to direction. One hundred and fifty-two signals of all kinds were ordered, one hundred and thirty-one, or 86.18 per cent., being fully justified. These do not include signals ordered at display stations where the velocity of the wind is only estimated. Of the twenty-five cautionary off-shore signals, fifteen were changed from cautionary signals. Four signals were ordered late. In sixty-nine cases winds of twenty-five miles or more per hour were reported for which no signals were ordered.

COLD-WAVE SIGNALS.

During October, 1885, there were ninety-three cold-wave signals displayed, of which number seventy-two, or 77.4 per cent. were justified.

As evidence of the value of cold-wave signals, and the favor with which these warnings are received by the general public, the following extracts from the reports of Signal Service observers, and from other sources, are given:

The meteorological committee state that "the establishment of the cold-wave warning signal at Jacksonville is highly appreciated by the board of trade and by the citizens of Florida, generally."—*Report of observer, Jacksonville, Florida.*

The cold-wave warnings are of vast benefit to the farmers and citizens here. Both the press and public are pleased that these warnings are given. The signals have brought the service and its workings prominently before our people.—*Report of displayman, Logansport, Indiana.*

The benefits derived from these warnings are very general to all classes. Shippers of perishable produce and dealers in fresh meats are greatly benefited. The warnings are duplicated by flag at Richmond Mills (eight miles south of the city), and give great satisfaction to the farmers and millers in that vicinity.—*Report of observer, Rochester, New York.*

Great interest is manifested by the public. During displays visitors are almost continuously in the office after information. Shippers of goods, coal and river men, and people of all avocations are interested in these warnings.—*Report of observer, Pittsburg, Pennsylvania.*

The warnings are of especial benefit to gardeners, roofers, dealers in oysters, fruit, and vegetables, farmers, ice-packers, railroad companies, and dealers in live-stock.—*Report of observer, Saint Louis, Missouri.*

The service has been very accurate in these warnings. The public now have unbounded confidence in the weather department. The observer is often consulted by interested parties, and great benefit is derived.—*Report of observer, Cleveland, Ohio.*

I consider the cold-wave signal of more practical benefit to the public at large than any recent improvement in the United States Signal Service. I know, personally, of many instances during the past winter where farmers were saved from serious losses in the shipment of potatoes and apples by the timely warning of the cold-wave signal. Other instances I know, by report, where losses were sustained in the shipment of live stock (cattle and hogs) by neglecting or disregarding the warning. Our citizens and farmers have learned to rely on the forecasts given almost implicitly, and it is not too much to say that, in my judgment, the property saved by its use during the past severe winter in the Mississippi Valley would pay for its maintenance for a generation.—*Extract from a letter from Hon. J. F. Webb, mayor of Lebanon, Illinois.*

RAILWAY WEATHER SIGNALS.

Prof. P. H. Mell, jr., director of the "Alabama Weather Service," in the report for October, 1885, states:

The verification of predictions for the whole area was 93 per cent. for temperature and 86 per cent for weather.

The following roads comprise this system: Western of Alabama; South and North; Montgomery and Mobile; Mobile and Girard; Georgia Pacific; East Tennessee, Virginia and Georgia system in Alabama; Memphis and Charleston; Columbus Western; Atlanta and West Point of Georgia; Northeastern of Georgia; Atlanta and Charlotte Air Line; Western and Atlantic; Georgia; East Tennessee, Virginia and Georgia system in Georgia; and Savannah, Florida and Western.

Prof. Benjamin F. Thomas, director of the "Ohio Meteorological Bureau," in the report for October, 1885, says:

The verification of railway signals for the month was as follows: For temperature, 96 per cent.; for weather, 89 per cent.

ATMOSPHERIC ELECTRICITY.

AURORAS.

Point Judith, Rhode Island, 6th: a brilliant auroral display was observed from 11 p. m. until midnight.

Mount Washington, New Hampshire, 8th: an aurora was observed at 9.45 p. m., consisting of two arches of pale straw-colored light. The upper arch disappeared at 10.20 and the lower one at 11 p. m.

Poplar River, Montana, 8th: at 9.05 p. m. a diffuse auroral light appeared in the north and continued without change until 11.30 p. m., when it disappeared.

Saint Vincent, Minnesota, 8th: an irregular auroral arch formed in the northern sky at 9 p. m.; it extended from 170° to 240° azimuth and had an altitude of 25°; the display was not bright; occasionally a few beams shot upward from the arch to an altitude of 10°.

Fort Totten, Dakota, 8th: an aurora was observed at 10.10 p. m., reaching an altitude of 30° and covering 150° of the horizon; at intervals an indistinct arch, with shooting beams, was visible; the display ended at 2.15 a. m. of the 9th.

Escanaba, Michigan, 8th: a faint aurora was observed from 7.58 to 10.40 p. m.

Fort Buford, Dakota, 8th: an aurora appeared at 7.40 p. m.; it consisted of an arch which extended from north-northwest to northeast, and to an altitude of 15°; it was most brilliant at 8.14 when the light extended upward 25°; after the latter hour it gradually faded.

Burlington, Vermont, 11th: an auroral light, extending from northwest to northeast, and to an altitude of 20°, was observed from 7.30 to 11 p. m.

Mount Washington, New Hampshire, 11th: an aurora was observed at 9.55 p. m., consisting of occasional streamers shooting upward from a base of light in the north, and converging at the zenith; at 11.40 p. m. the display was still visible though less brilliant, and at midnight it had entirely disappeared.

Mackinaw City, Michigan, 11th: at 7.30 p. m. there appeared a faint auroral light of pale pink color, reaching an altitude of 20° and covering 50° of the horizon. The display continued until 12.20 a. m., when the sky was obscured by clouds.

Marquette, Michigan, 12th: an aurora, resembling the morning dawn, was observed at 1 a. m.

Moorhead, Minnesota, 13th: a faint aurora was observed from 10.30 to 11.50 p. m.; it consisted of a pale light in the north extending to an altitude of 15°.

Fort Totten, Dakota: an aurora, consisting of a pale yellow color, extending to an altitude of 20° and covering 100° of the horizon, was observed from 10 p. m. to midnight. A faint auroral display was also observed on the 14th from 10.15 to 11.50 p. m.

Mount Washington, New Hampshire, 15th: a brilliant aurora was observed at 10.55 p. m.; the light was of an intense greenish color, and illuminated the mountain as brightly as though the full moon shone.

Alpena, Michigan, 15th: an aurora was first noticed at 10.10 p. m., consisting of a few faint streamers, which appeared and disappeared at intervals until 10.50 p. m., when they were last observed.

Table of miscellaneous meteorological data for October, 1885—Signal Service observations.

Signal Service observations.																																
Stations.		Elevation above sea-level.	Atmospheric pressure (in inches and hundredths).				Temperature of the air (in degrees Fahrenheit).												Winds.													
			Mean actual barometer.	Departure from normal.	Mean reduced barometer.	Extremes.	Extremes.	Daily ranges.	Mean rel. humidity.	Mean dew-point.	Precipitation.	Departure from normal.	Total movement.	Prevailing direction.	Miles p. h.	Direction.	Maximum velocity.	No. of rainy days.	No. of cloudy days.	No. of fair days.	No. of clear days.											
New England.																																
Eastport	61	29.95	-.04	30.02	30.37	29.27	30.10	47.9	+0.9	61.0	21	53.3	29.4	42.6	31.6	23.0	10	4.2	29.82	2.42	5.96	+1.40	6.84	s.	33	se.	14	11	10	12	9	
Portland	99	29.92	-.05	30.03	30.38	29.24	30.12	47.5	+0.3	68.5	1	54.9	40.9	38.7	24.8	10	5.8	28.3	9.42	4.32	+0.74	4.84	s.	26	s.	4	11	6	13	12		
Mount Washington	6,279	23.73	.....	30.07	30.37	29.53	30.1	47.5	+0.3	73.4	4	59.1	44.2	40.5	24.7	4	5.6	29.77	8.43	11.11	+3.70	20.96	w.	94	se.	14	12	4	11	16		
Boston	125	29.88	-.10	30.01	30.35	29.22	30.1	47.5	+0.3	68.5	3	59.6	49.1	33.6	21.8	30	4.3	29.84	5.49	7.81	+1.53	7.39	w.	40	e.	13	9	5	12	14		
Block Island	27	30.00	.....	30.02	30.32	29.27	30.10	47.5	+0.3	72.0	4	61.6	44.3	39.0	.....	.....	.....	.....	.....	.....	+0.80	9.58	sw.	44	e.	13	12	8	10	13		
Narragansett Pier	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Point Judith	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
New Haven	107	29.91	.....	30.02	30.31	29.29	30.10	47.5	+0.3	76.0	1	60.9	43.0	44.5	25.2	26	9.4	29.78	3.44	4.4	+5.37	1.63	5.34	n.	30	ne.	29	9	8	14	.....
New London	47	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Middle Atlantic States.																																
Albany	83	29.95	-.09	30.03	30.35	29.40	29.04	50.3	-1.0	77.7	1	59.7	28.0	42.3	49.7	28.6	17	9.5	22.75	3.42	1	+5.54	2.46	4.30	s.	28	n.	30	9	13	10	8
New York City	104	29.85	-.11	30.02	30.30	29.20	29.11	54.5	-1.1	74.1	3	62.7	34.3	47.9	38.9	24.0	30	7.4	27.6	1.46	4	+5.62	2.46	6.88	sw.	44	se.	29	9	7	12	12
Philadelphia	117	29.90	-.12	30.01	30.32	29.10	29.13	54.8	-1.5	78.2	3	63.4	34.0	47.4	43.6	27.5	28	5.5	29.76	1.46	8	+3.33	0.47	6.26	sw.	30	ne.	29	12	6	11	14
Atlantic City	13	29.99	-.13	30.00	30.30	29.08	29.12	55.8	-1.3	73.9	3	63.0	33.6	49.2	40.3	24.2	21	2.8	12.85	7.51	3	+2.94	0.13	5.89	s.	40	e.	29	11	5	15	11
Barnegat City	22	29.99	-.13	30.00	30.30	29.10	29.13	56.7	+0.3	74.2	4	63.9	35.7	50.5	38.5	25.5	30	7.0	9.85	8.24	4	+3.50	0.04	9.59	e.	50	e.	29	10	5	15	11
Cape May	27	30.01	.....	30.02	30.34	29.13	29.13	56.7	+0.3	74.2	4	63.9	35.7	50.5	38.5	25.5	30	7.0	9.85	8.24	4	+3.50	0.04	9.59	e.	50	e.	29	10	5	15	11
Little Egg Harbor	27	30.01	.....	30.02	30.34	29.13	29.13	56.7	+0.3	74.2	4	63.9	35.7	50.5	38.5	25.5	30	7.0	9.85	8.24	4	+3.50	0.04	9.59	e.	50	e.	29	10	5	15	11
Sandy Hook	28	30.00	-.11	30.02	30.30	29.18	29.12	55.3	-1.6	75.0	1	61.8	36.1	50.3	39.9	24.0	30	6.2	28.5	1.50	6	+3.77	1.04	.....	.....	.....	.....	.....	.....	.....
Cape Henlopen	45	29.97	-.14	30.00	30.33	29.11	29.12	55.3	-1.6	75.0	1	61.8	36.1	50.3	39.9	24.0	30	6.2	28.5	1.50	6	+3.77	1.04	.....	.....	.....	.....	.....	.....	.....
Baltimore	106	29.10	-.13	30.01	30.35	29.15	29.19	54.7	-3.3	75.5	1	64.2	37.5	48.3	38.1	24.8	27	6.6	8.75	1.46	8	+6.51	3.65	3.92	n.	24	s.	13	11	8	16	7
Ocean City	16	29.99	-.13	30.01	30.35	29.15	29.19	54.7	-3.3	75.5	1	64.2	37.5	48.3	38.1	24.8	27	6.6	8.75	1.46	8	+6.51	3.65	3.92	n.	24	s.	13	11	8	16	7
Washington City	16	29.99	-.13	30.01	30.35	29.15	29.19	54.7	-3.3	75.5	1	64.2	37.5	48.3	38.1	24.8	27	6.6	8.75	1.46	8	+6.51	3.65	3.92	n.	24	s.	13	11	8	16	7
Cape Henry	8	30.00	.....	30.02	30.32	29.18	29.18	55.8	-2.5	75.1	3	64.7	45.4	30.3	27.0	11	5.8	29.78	6.47	4	+8.69	5.78	3.70	s.	26	e.	12	10	7	14	10	
Chincoteague	652	29.32	-.13	29.99	30.33	29.18	29.18	55.8	-2.5	75.1	3	64.7	45.4	30.3	27.0	11	5.8	29.78	6.47	4	+8.69	5.78	3.70	s.	26	e.	12	10	7	14	10	
Lynchburg	30	30.01	-.09	30.02	30.35	29.26	29.18	56.4	-0.8	81.6	3	67.9	44.1	40.5	35.1	27	6.4	28.0	3.46	9	+8.67	5.82	2.31	sw.	17	nw.	21	11	8	8	15	
Norfolk	30	30.01	-.09	30.02	30.35	29.26	29.18	56.4	-0.8	81.6	3	67.9	44.1	40.5	35.1	27	6.4	28.0	3.46	9	+8.67	5.82	2.31	sw.	17	nw.	21	11	8	8	15	
South Atlantic States.																																
Charlotte	808	29.15	-.13	29.98	30.31	29.38	29.03	57.2	-6.4	73.8	19	65.7	37.8	48.5	36.0	23.7	6	7.3	9.74	8.48	4	+6.64	3.41	3.57	ne.	26	se.	12	10	5	10	16
Fort Macon	12	29.98	-.12	29.97	30.27	29.34	29.04	64.1	-3.5	81.2	3	69.6	45.3	57.9	33.3	19.5	21	4.8	12.75	9.55	10	+5.51	2.20	10.70	ne.	36	se.	12	11	4	10	17
Hatteras	9	30.00	-.12	29.97	30.27	29.34	29.04	64.1	-3.5	81.2	3	69.6	45.3	57.9	33.3	19.5	21	4.8	12.75	9.55	10	+5.51	2.20	10.70	ne.	36	se.	12	11	4	10	17
Kitty Hawk	34	29.95	-.14	29.96	30.24	29.39	29.08	62.1	-4.0	79.9	3	69.5	40.1	57.4	38.4	21.9	23	3.5	24.79	2.55	8	+5.03	0.05	10.74	ne.	44	e.	29	13	5	14	12
Smithville	52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wilmington	52	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Charleston	52	29.94	-.11	29.96	30.23	29.49	29.12	64.5	-2.6	81.9	3	71.4	46.0	58.0	35.9	20.4	7	3.8	28.70	7.57	1	+8.09	3.42	5.65	.....	.....	.....	.....	.....	.....
Augusta	183	29.82	-.14	29.97	30.27	29.42	29.12	65.8	-5.1	82.4	3	72.3	38.3	50.4	43.3	33.5	10	6.4	17.84	51.6	4	+4.15	2.02	3.16	ne.	36	s.	12	9	4	15	12
Savannah	87	29.90	-.12	29.96	30.23	29.44	29.12	65.8	-5.1	82.4	3	72.3	38.3	50.4	43.3	33.5	10	6.4	17.84	51.6	4	+4.15	2.02	3.16	ne.	36	s.	12	9	4	15	12
Jacksonville	43	29.93	-.11	29.94	30.18	29.42	29.12	65.8	-5.1	82.4	3	72.3	38.3	50.4	43.3	33.5	10	6.4	17.84	51.6	4	+4.15	2.02	3.16	ne.	36	s.	12	9	4	15	12
Florida Peninsula.																																
Cedar Keys	22	29.93	-.11	29.91	30.12	29.27	29.10	64.8	-5.3	83.9	1	75.3	51.4	62.7	32.5	20.6	7	4.5	30.81	0.62	5	+4.38	1.03	7.29	w.	48	s.	11	10	9	14	8
Key West	20	29.94	-.10	29.91	30.08	29.31	29.10	64.8	-5.3	83.9	1	75.3	51.4	62.7	32.5	20.6	7	4.5	30.81	0.62	5	+4.38	1.03	7.29	w.	48	s.	11	10	9	14	8
Sanford	125	29.95	.....	29.94	30.13	29.50	29.10	62.7	-4.4	90.4	1	79.5	48.2	64.3	42.2	25.9	31	5.0	26.77	2.69	8	+5.07	0.61	7.42	n.	29	nw.	29	11	6	20	5
Eastern Gulf States.																																
Atlanta	1,129	28.84	-.12	30.00	30.27	29.58	29.09	56.5	-7.6	73.9	16	64.9	37.0	49.0	36.9	26.7	16	4.8	11.76	3.48	2	+3.94	1.48	7.25	nw.	27	w.	29	8	6	9	16
Pensacola	30	29.95	-.06	29.97	30.23	29.67	29.06	54.7	-7.2	80.1	1	73.1	43.4	57.1	37.5	24.8	23	6.5	27.0	9.54	3	+2.38	1.90	5.14	nw.	18	nw.	11	6	10	9	12
Mobile	35	29.99	-.05	29.99	30.26	29.68	29.06	56.2	-5.4	82.2	1	72.9	40.7	53.7	37.5	24.8	23	6.5	27.0	9.54	3	+2.38	1.90	5.14	nw.	18	nw.	11	6	10	9	12
Montgomery	219	29.79	-.08	29.99	30.25	29.60	29.06	56.9	-5.2	79.4	1	70.7	40.0	53.9	37.5	24.8	23	6.5	27.0	9.54	3	+2.38	1.90	5.14	nw.	18	nw.	11	6	10	9	12
Vicksburg	209	29.82	-.06	30.02	30.35	29.75	29.06	61.2	-5.2	81.8	17	72.0	38.4	52.5																		

Duluth, Minnesota, 15th: a pale, white auroral light was observed from 9.10 p. m. to 11.25 p. m.; at times it appeared as a partial arch; no beams were visible.

Point Judith, Rhode Island, 15th: an auroral display began at 11.30 p. m. and continued until 4 a. m. of the 16th. The light was of straw color; streamers moving across the sky from east to west were observed.

Moorhead, Minnesota, 15th: a bright auroral display was observed at 10 p. m.; the entire northern sky was covered with a waving light; occasional streamers were also observed, reaching an altitude of 75°; the display ended at 6.20 a. m. of the 16th.

Fort Totten, Dakota, 15th: a very bright aurora appeared at 9.10 p. m., consisting of an arch which extended upward 30° and covered 165° of the horizon; shooting beams were occasionally seen; the display ended at 11.50 p. m.

Block Island, Rhode Island: a faint aurora was observed at midnight of the 15-16th, consisting of an arch of pale light extending to an altitude of 10° and covering 90° of the horizon; no streamers were visible; the display continued until daylight.

Poplar River, Montana, 16th: a faint aurora, partly obscured by clouds, was observed at 1 a. m.; there were two pale streamers which extended to an altitude of 48°; the display ended at 2 a. m.

Fort Bennett, Dakota, 16th: between 12.10 and 1.15 a. m. a faint aurora was observed in the north-northeast, consisting of an arch covering 30° of the horizon and extending upward 9°.

Fort Buford, Dakota, 16th: an aurora was observed at 4.44 a. m. and continued until 5.15; it consisted of a well-defined arch extending upward 15° and covering the horizon from north-northwest to northeast.

Escanaba, Michigan, 28th: a faint aurora was observed from 8.14 to 9.53 p. m.

Mackinaw City, Michigan, 29th: when the sky cleared at 8.30 p. m. an aurora was observed; the display continued until 10.45 p. m., consisting of a light of pale pink color, which extended upward 15° and over 30° of the horizon.

Escanaba, Michigan, 30th: a faint aurora was observed from 8.53 to 11.44 p. m.

Mackinaw City, Michigan, 30th: an auroral light was observed from 8 to 11.45 p. m.; altitude, 25°; azimuth, 30°.

Marquette, Michigan, 30th: an aurora was observed at 10 p. m.; an arch appeared covering 40° of the horizon; the display ended at 11.30.

Alpena, Michigan, 30th: an aurora appeared at 9.40 p. m., consisting of a diffuse light on the northern horizon; the display ended at 11.30 p. m.

Portland, Maine, 31st: a faint auroral display was observed from 9.45 p. m. until midnight; it consisted of an irregular arch of 30° and covered 90° of the horizon.

Poplar River, Montana, 31st: a pale auroral arch was visible from 9.25 to 11.40 p. m.; two faint streamers rose to an altitude of 15°.

Mount Washington, New Hampshire, 31st: an auroral light of bluish color was observed from 9.30 to 11.40 p. m.; several streamers were visible.

Other auroral displays were observed during the month, as follows:

8th.—Webster, Dakota; Sycamore, Illinois; Cresco, Iowa; Gardiner, Cornish, and Eastport, Maine; Manistique, Michigan; Contoocook, New Hampshire; Wauseon, Ohio; Newport, Vermont.

9th.—Eastport and Kent's Hill, Maine.

11th.—Gardiner, Cornish, Orono, Buckfield, and Portland, Maine; Cambridge, Massachusetts; Hiram, Ohio; Newport, Vermont; Manitowoc and Madison, Wisconsin.

12th.—Cornish, Maine.

14th.—Webster, Dakota; Cambridge, Massachusetts, aurora suspected; Harvard, Nebraska.

15th.—Gardiner, Maine; Cambridge, Massachusetts.

16th.—Webster, Dakota.

17th.—Webster, Dakota.

18th.—Fort Totten, Dakota; Dyberry, Pennsylvania.

21st.—Gardiner, Maine.

27th.—Manistique, Michigan.

28th.—Cresco, Iowa; Manistique, Michigan.

30th.—Manistique, Michigan.

31st.—Cambridge, Massachusetts; North Volney, New York.

THUNDER-STORMS.

Thunder-storms occurred in the various states and territories, as follows:

Arizona.—Prescott, 9th, 16th; San Carlos, 9th, 22d; Fort Thomas, 22d.

Arkansas.—Lead Hill, 1st; Fort Smith, 11th, 12th.

California.—Sacramento, 6th; San Francisco and Oroville, 7th; Fort Bidwell, 9th, 22d.

Colorado.—West Las Animas, 10th; Montrose, 10th, 11th.

Connecticut.—New Haven, 3d; Bethel and Southington, 3d, 4th, 29th; South Colebrook, 3d, 29th.

Dakota.—Fort Totten, 10th.

Delaware.—Cape Henlopen, 2d, 30th.

District of Columbia.—Washington City, 2d, 3d, 13th, 29th.

Florida.—Pensacola, 1st, 2d, 3d, 28th; Cedar Keys, 2d; Key West, 2d, 4th, 10th, 11th, 28th; Sanford, 2d, 9th; Limona, 8th, 28th; Merritt's Island, 9th, 11th.

Georgia.—Atlanta, 3d, 28th; Athens, 28th.

Illinois.—Anna, 1st; Cairo, 1st, 2d, 18th; Chicago, 2d; Springfield, 2d, 18th, 22d, 28th; Charleston, 2d, 7th, 18th, 27th; Collinsville, 2d, 27th; Mattoon and Windsor, 18th, 27th.

Indiana.—Greencastle, 2d, 3d, 7th, 18th, 19th, 27th; Indianapolis and Lafayette, 18th, 27th; Fort Wayne and Logansport, 18th; Terre Haute, 27th; Jeffersonville, 28th.

Indian Territory.—Forts Reno and Sill, 24th.

Iowa.—Independence, 11th; Indianola, 11th, 12th, 27th; Keokuk, 11th, 18th, 27th; Burlington, 12th, 18th, 27th; Fort Madison, 17th, 27th; Cedar Rapids and West Union, 24th; Des Moines, 27th.

Kansas.—West Leavenworth, 1st, 11th, 12th, 18th, 24th, 28th; Allison, 10th; Abison, 10th, 11th, 18th, 21st, 27th; Fort Scott, 10th, 11th; Leavenworth, 11th, 12th, 27th, 28th; Concordia and Wyandotte, 11th; Independence, 11th, 24th; Wellington, 11th, 17th, 24th, 27th; Westmoreland, 11th, 25th, 27th; Yates Centre, 11th, 24th, 27th; Topeka, 18th, 24th, 27th; Ninescaw, 24th.

Louisiana.—Shreveport, 11th, 12th, 25th, 31st; Point Pleasant, 31st.

Maine.—Bangor, Eastport, and Gardiner, 3d; Portland, 3d, 14th; Orono, 3d, 14th, 30th.

Maryland.—Fort McHenry, 2d; Ocean City, 2d, 4th; Baltimore, 2d, 29th; Fallston, 3d, 29th.

Massachusetts.—Blue Hill, Fall River, Somerset, Taunton, and Worcester, 3d; Westborough, 3d, 4th; Dudley, 3d, 7th; Amherst and Rowe, 4th.

Michigan.—Alpena, Birmingham, Detroit, Escanaba, Grand Haven, Lansing, Mackinaw City, Manistique, and Saginaw, 2d; Mottville, 18th; Port Huron, 27th.

Missouri.—Carthage, 11th; Lamar, 11th, 27th; Saint Louis, 12th, 31st; Conception, 24th, 27th.

Nebraska.—North Platte, 10th; Genoa, 10th, 27th; Crete and Marquette, 11th; De Soto, Omaha, and Yutan, 11th, 27th; Tecumseh, 27th.

Nevada.—Carson City, 8th; Fort McDermitt, 9th.

New Hampshire.—Contoocook, 4th, 8th.

New Jersey.—Barnegat City, 3d; Dover and Sandy Hook, 3d, 4th; Somerville, 3d, 4th, 5th; Beverly and Moorestown, 3d, 4th, 29th; Little Egg Harbor, 3d, 29th; Princeton, 4th; Atlantic City, Cape May, and Readington, 29th.

New Mexico.—Fort Stanton, 9th, 17th.

New York.—Fort Columbus, Mountainville, and West Point, 3d; New York City, 3d, 4th; Albany and Menand Station, 4th; Ithaca, 3d, 4th, 27th; North Volney, 13th; Buffalo, 13th, 14th, 27th; Humphrey, 27th.

North Carolina.—Hatteras, 1st; Charlotte, 2d; Wilmington, 2d, 4th; New River Inlet, 2d, 12th, 29th; Weldon, 3d; Smithville, 12th; Stateville, 20th; Raleigh, 29th.

Ohio.—Cleveland, Garrettsville, and Napoleon, 3d, 27th; Toledo and Wauseon, 18th; College Hill, 21st, 29th; Cincinnati, Jacksonborough, Hiram, North Lewisburg, Tiffin, Westerville, and Yellow Springs, 27th.

Oregon.—East Portland, 9th; Portland, 10th.

Pennsylvania.—Wellsborough, 2d; Dyberry, 3d; Fallsington, 3d, 4th, 29th, Chambersburg, 3d, 13th; Erie, 3d, 27th; Grampian Hills and Pittsburg, 13th; Philadelphia and South Bethlehem, 29th.

Rhode Island.—Block Island, Narragansett Pier, and Point Judith, 3d.

South Carolina.—Kirkwood and Stateburg, 2d, 3d; Spartanburg, 2d, 3d, 20th; Pacolet, 20th.

Tennessee.—Memphis, Milan, and Nashville, 1st; Chattanooga, 1st, 28th, 29th; Ashwood and Knoxville, 3d and 28th; Austin, 13th.

Texas.—El Paso, 1st, 10th; New Ulm, 2d, 18th, 25th; Indianola, 11th; San Antonio, 11th, 18th; Brownsville, 12th; Fort Stockton, 17th; Palestine, 18th; Abilene, 18th, 24th; Galveston, 18th, 25th, 31st; Cleburne, 24th.

Utah.—Frisco, 8th; Salt Lake City, 9th, 10th.

Vermont.—Brattleborough, Lunenburg, Newport, and Strafford, 4th; Woodstock, 4th, 21st; Charlotte, 14th.

Virginia.—Fort Myer, 2d, 3d, 13th, 29th; Bird's Nest, 2d, 3d, 21st, 29th; Dale Enterprise, 3d, 8th, 29th; Cape Henry, Chincoteague, and Norfolk, 3d, 29th; Blacksburg, Lynchburg, and Variety Mills, 29th; Snowville, 30th.

Washington Territory.—Pysht, 29th; Neah Bay, 29th, 30th.

Wisconsin.—Manitowoc, 24th.

Wyoming.—Fort Bridger, 9th.

The following notes on the probable connection between the occurrence of thunder-storms at special stages of the tide, have been prepared by Junior Prof. H. A. Hazen, of the Signal Office:

A frequent inquiry is made as to whether the tides in any way can influence the occurrence of thunder-storms. In general, it is much safer to first determine how such influence can be possible and afterward to determine its amount and detailed action by actual observation. There are many cases, however, in which we may be able to establish certain facts pointing to interdependence between two phenomena, although there may be no apparent connection. Great care must be taken in the latter case that we do not insist on the connection, except as supported by the clearest proofs. For example, there is a well-nigh universal belief that there is an intimate connection between different phases of the moon and the weather. The reason for this is, in part, that during any particular phase all kinds of weather are experienced, and those who hold one view only consider the weather that coincides with their views, while a complete study would show that after all there is but little difference between the weather at different phases. Attempts have already been made to prove a connection between thunder-storms and the moon; it is evident that, since the moon is the principal cause of the tides, if such connection could be established we would have a partial proof of the point now under discussion. Doctor Köppen, of Germany, has published an investigation of the moon's influence upon thunder-storms, and the writer has made a study of the same from the very complete records of the Signal Service for 1884. The following table exhibits the results side by side:

Moon's Phase.	Dr. Köppen.		Signal Service.	
	No. of storms.	Per cent.	No. of storms.	Per cent.
New	336	25.2	3,538	29.5
First quarter	406	30.5	3,232	27.0
Full	270	20.3	2,930	24.4
Last quarter	321	24.1	2,296	19.1
Total	1,333	100.1	11,996	100.0

These results are quite accordant, and show a slight predominance in the number of storms during new moon and first quarter above the other two phases. The amount of the effect it will be seen, however, is extremely slight. Turning to the subject in hand, we find many well-educated people residing along the Atlantic coast who believe that no severe thunder-storm will occur in their neighborhood during a falling tide. This belief has been recently communicated to this office by Mr. S. B. Strong, the voluntary observer at Setauket, New York. There seemed to be sufficient reason for entering upon an investigation, even though no relationship between the phenomena could

be premised from general laws. There are many serious difficulties in the way of such an investigation.

1st. The storms themselves are not always well and sharply defined occurrences.

2d. It is not easy to get the moment of most intense action during the progress of the storm or any other moment in the life of a storm which will enable us to make a rigid comparison between one and another.

3d. We cannot easily determine whether we are at the centre or on the edge of a storm.

4th. The question of the place where we shall take the tide is an intricate one, though it will be safer at the outset to take the tide on promontories rather than at the head of bays or up large rivers.

With the above conditions in mind, 197 storms along the Atlantic coast from Savannah, Georgia, to Portland, Maine, have been taken, without selection, and studied in connection with rising and falling tide. Three divisions have been made; in the first were placed all storms which occurred on the rising tide, in the second all storms which lasted over from the rising tide or occurred very near the highest point, in the third all storms that occurred on a falling tide. Out of these 197 storms 111, or 56 per cent., were in the first division, 57, or 29 per cent., were in the second, and 29, or 15 per cent., were in the third. Considering half the storms in the second division as belonging to the first we have 70.5 per cent. occurring on the rising tide as against 29.5 per cent. on the falling. This is a rather remarkable result and needs corroboration by more observations, and by extending the discussion to other countries. The results would seem to be worthy of a much more exhaustive study. It is very plain that the question of a connection between thunder-storms and the tides does not stop at the sea-coast. We ought to obtain answers to question like the following:

Is there a direct effect from the tide on the storm?

Is there a force acting upon both?

Is the influence at the coast alone?

Can we find any general law connecting the occurrence of thunder-storms inland with those on the coasts?

We may go still farther. Since it has been fairly well established that our more severe thunder-storms occur in the southeast quadrant of low areas, may we not be enabled to correlate the development and progress of our more general storm-actions with some general law not yet fully discovered?

OPTICAL PHENOMENA.

SOLAR HALOS.

Solar halos were observed in the various states and territories, as follows:

Alabama.—1st.

Arizona.—7th, 20th.

California.—12th, 15th, 22d, 23d, 25th, 26th.

Colorado.—5th, 13th, 26th.

Connecticut.—12th.

Dakota.—2d, 12th, 31st.

Florida.—26th, 27th.

Georgia.—8th, 10th, 19th, 27th.

Idaho.—13th.

Illinois.—11th, 14th, 15th, 17th, 18th, 26th, 27th.

Indiana.—15th, 18th.

Iowa.—3d, 4th, 10th, 11th, 17th, 24th, 26th, 29th.

Kansas.—26th.

Kentucky.—11th.

Maine.—13th, 31st.

Michigan.—10th, 11th, 12th, 14th, 17th, 18th, 27th.

Missouri.—15th.

Montana.—4th, 5th, 12th, 16th.

Nevada.—11th, 13th, 15th, 25th.

New Jersey.—12th, 19th.

New York.—12th, 13th, 16th, 18th.

North Carolina.—20th, 28th.

Ohio.—7th, 12th, 15th, 17th, 18th, 20th, 24th to 27th.

Pennsylvania.—10th, 12th, 18th, 19th, 30th.

Rhode Island.—12th, 20th.

South Carolina.—8th, 10th, 19th, 20th, 25th, 29th.

Tennessee.—7th, 11th, 15th, 18th, 27th, 30th.

Texas.—6th, 31st.

Utah.—11th.

Virginia.—11th, 18th, 19th, 26th, 28th.

Washington Territory.—11th, 12th, 16th.

Wisconsin.—12th, 17th, 18th, 24th.

Wyoming.—5th, 8th, 9th, 13th, 14th, 16th, 17th, 24th to 28th.

LUNAR HALOS.

Lunar halos were observed in the various states and territories, as follows:

California.—12th, 14th, 24th.
 Colorado.—14th.
 Connecticut.—19th, 30th.
 Dakota.—12th, 14th, 18th, 20th, 21st, 24th, 25th, 26th, 30th.
 District of Columbia.—19th.
 Florida.—15th to 25th.
 Georgia.—15th, 16th, 18th.
 Idaho.—24th, 26th.
 Illinois.—14th, 16th, 17th, 24th, 26th, 30th.
 Indiana.—14th, 18th, 24th to 27th.
 Iowa.—2d, 16th, 17th, 25th, 26th, 29th.
 Kansas.—17th, 23d, 25th, 28th.
 Kentucky.—15th, 17th, 18th.
 Maine.—20th, 26th.
 Massachusetts.—12th, 18th, 27th.
 Michigan.—14th, 18th, 24th, 25th, 26th.
 Minnesota.—20th, 25th.
 Montana.—21st, 24th, 25th.
 Nebraska.—14th to 18th, 20th, 21st, 23d, 25th, 26th.
 Nevada.—14th, 16th, 23d, 28th.
 New Hampshire.—26th.
 New Jersey.—11th, 19th, 28th.
 New York.—18th, 22d, 23d, 27th.
 Ohio.—4th, 11th, 17th, 18th, 22d, 26th, 27th.
 Oregon.—4th, 13th, 23d.
 Pennsylvania.—19th, 21st, 22d, 23d, 24th, 28th.
 Rhode Island.—12th, 18th, 19th.
 South Carolina.—12th, 15th, 19th, 27th.
 Tennessee.—18th, 24th, 25th.
 Texas.—14th to 17th, 19th to 23d, 25th.
 Utah.—14th, 24th.
 Vermont.—17th, 26th.
 Virginia.—1st, 20th, 23d, 26th, 28th, 30th.
 Washington Territory.—2d, 16th, 17th, 27th, 28th.
 Wisconsin.—14th, 18th, 24th, 28th.
 Wyoming.—13th, 16th, 19th, 24th, 29th.

The phases of the moon during October were: last quarter, 1st, 6.23 a. m.; new moon, 8th, 2.25 a. m.; first quarter, 15th, 8.14 p. m.; full moon, 23d, 4.16 a. m.; last quarter, 30th, 12.52 a. m.; perigee, 3d, 6 p. m.; apogee, 16th, 12.18 a. m.; perigee, 28th, 2.36 p. m.

MIRAGE.

Mirages were observed during the month at the following places:

Webster, Dakota, 6th, 16th.
 Salina, Kansas, 15th, 16th, 22d, 25th.
 Saint Vincent, Minnesota, 13th.
 Marquette, Nebraska, 14th, 15th.
 Harvard, Nebraska, 15th.
 Riedsville, North Carolina, 5th.
 Indianola, Texas, 28th, 29th.

MISCELLANEOUS PHENOMENA.

SUN SPOTS.

Prof. David P. Todd, director of the Lawrence Observatory, Amherst, Massachusetts, furnishes the following record of sun spots for October, 1885:

Date— October, 1885.	No. of new.		Disappeared by solar rotation.		Reappeared by solar rotation.		Total No. visible.		Remarks.
	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	Gr'ps	Spots	
4, 11 a. m.							4	25	
7, 9 a. m.			0	0			4	30	
9, 12 m.	0	0	0	0	0	0	4	25	
11, 10 a. m.	0	0	0	0	0	0	4	20	
12, 17 a. m.	0	0	0	5	0	0	3	12	
14, 4 p. m.	0	0					0	0	
10, 1 p. m.	1	2	0	0	1	2	1	2	
18, 3 p. m.	3	35	0	0			4	40	
22, 9 a. m.	2	30					3	65	
23, 2 p. m.	1	15	0	0	0	0	4	80	
24, 2 p. m.	2	20	1	3	1	5	5	95	
25, 4 p. m.	2	20	0	0	1	15	7	115	

Faculae were seen at the time of every observation.

‡ Approximated.

Professor Carpenter, of the Michigan State Agricultural College, of Lansing, reports sun spots during the month of October, as follows:

1st, five groups, twelve spots; 9th, 11.15 a. m., four groups, twenty-three spots; 10th, 11.15 a. m., three groups, forty spots; 14th, 1.15 p. m., none observed; 15th, three groups, twelve spots; 20th, 3.30 p. m., four groups, thirty-five spots; 22d, 2.50 p. m., three groups, forty-two spots; 24th, — p. m., seven groups, fifty-eight spots.

SUNSETS.

The characteristics of the sky, as indicative of fair or foul weather for the succeeding twenty-four hours, have been observed at all Signal Service stations. Reports from one hundred and seventy-one stations show 5,254 observations to have been made, of which three were reported doubtful; of the remainder, 5,251, there were 4,724, or 90.0 per cent., followed by the expected weather.

DROUGHT.

Wysox, Bradford county, Pennsylvania: the wells and streams in this vicinity, during the first and second decades of the month, were almost dry, but the heavy rains of the latter part of the month relieved the drought.

Fallsington, Bucks county, Pennsylvania, 31st: many wells in this vicinity were dry during the month.

Lead Hill, Boone county, Arkansas, 31st: the small streams in this part of the state have dried up or become so low that the supply of water for stock is very poor. The soil is so hard, from the continued drought, that the seeding of wheat has been much retarded.

Indianola, Texas: reports from the surrounding country on the 26th stated that gardens were suffering in consequence of drought.

Tucson, Arizona: pasturage is very poor and the supply of water for stock very limited at the close of the month.

Fort Grant, Arizona: at the end of the month severe drought prevailed in this part of the territory. Streams have dried up and stock has suffered much on account of scarcity of water. Water for domestic uses is hauled a distance of two miles.

EARTHQUAKES.

Variety Mills, Nelson county, Virginia: at 11.36 p. m. on the 9th a sharp shock of earthquake was felt at this place. It was accompanied by a rumbling noise, resembling thunder, which gradually died away. A second, but much less noticeable, shock occurred about one hour later.

Dale Enterprise, Rockingham county, Virginia, 9th: a slight shock, which is supposed to have been due to an earthquake, was felt in this and Augusta counties at 11.35 p. m. The earth trembled, and a strange, cracking noise was heard at the time of the shock.

Lynchburg, Virginia: during the night of the 9-10th two slight but distinct shocks of earthquake were felt here. The first shock occurred at 11.35 p. m., and the second at 12.40 a. m. The shocks were preceded by a rumbling noise which seemed to come from the northeast; they were sufficient to cause window-panes to rattle.

Petersburg, Virginia: three distinct shocks of earthquake were felt in this city between 11 p. m. and midnight of the 9th. Each shock was preceded by a rumbling sound, sufficiently loud to cause considerable alarm. Windows were shaken and furniture was displaced by the shocks.

Staunton, Virginia: a distinct shock of earthquake, lasting about thirty seconds, was felt here at 11.40 p. m. on the 9th.

Richmond, Virginia: an earthquake shock was felt in certain parts of the city during the night of the 9-10th. The vibrations were very slight.

The following is an extract from the Washington "Evening Star" of October 10, 1885:

An earthquake shock is reported to have occurred in this city near midnight last night. A gentleman, living on N street, near 12th, states that while reading in his library at 11.42 o'clock he felt a clearly-defined earthquake, the tremor continuing from ten to twenty seconds.

At the Signal Office the observers did not notice any shock, nor did the

registering barometer show any disturbance such as is usual when a shock occurs. No shock was noticed at the Naval Observatory.

Olympia, Washington Territory, 9th: an earthquake shock occurred at 8.00 a. m. The vibration was from south to north. The duration of the shock was less than one minute.

East Portland, Oregon: three shocks of earthquake, each of about one second's duration and separated by an interval of six seconds, occurred between 1 and 2 a. m. of the 10th.

The following is an extract from the report of Earl Flint, M. D., international co-operating observer, Rivas, Nicaragua:

The earthquake of October 11th was more prolonged than that which was felt at Chinendega in 1851. The shock was general throughout western Nicaragua; it was also felt to the eastern part of the axial line, beyond the lake, and along the eastern slope of the main Cordilleras, although it was less severe in that region. Reports from prefects give the greatest force at Leon, Old Chinendega, and Managua. Leon Cathedral was fractured in various places; Laborio church tower was telescoped, and other churches were injured. The government house, barracks, seminary, institute, and bishop's palace were also damaged, and most of the adobe houses lost partition walls. Managua and Chinendega suffered similar losses, though somewhat less. The shock began with a slight and prolonged oscillation, northwest and southeast, and its duration allowed most of the people to reach the streets and yards; but those who had retired, being delayed in opening doors, were bruised by the falling tiles and partition walls. Five deaths occurred at Leon and one at Managua.

The following is an extract from a communication received by the Chief Signal Officer from Mr. John J. de Jongh, C. E., at San José, Costa Rica, Central America:

There was a very strong earthquake on the night of the 11th throughout the Republic of Nicaragua; it caused a great amount of damage in Managua and Leon. I felt the shock at San José at 10.30 p. m.; it was not strong, but was of long duration. The temperature at the time was 60°; barometer (aneroid), 26.77. At about midday of the 11th we had a very strong north wind, which is an unusual occurrence at this season.

San Francisco, California, 16th: a very slight shock of earthquake was felt in this city at 7.45 a. m. It was so slight that the direction of vibration was not ascertained.

San Rafael, Marin county, California: a very slight earthquake shock occurred here at 4.50 a. m. of the 16th.

Napa, Napa county, California: there was a light shock of earthquake felt here at about midnight of the 15-16th, and quite a heavy shock occurred at 4.45 a. m. of the 16th. The vibrations were from north to south.

Santa Rosa, Sonoma county, California: three distinct shocks of earthquake were felt here shortly before 5 a. m. of the 16th. The vibrations were northeast and southwest.

The following is an extract from the "Rochester Morning Herald" of October 19, 1885:

SANDERSVILLE, WASHINGTON COUNTY, GEORGIA, 18th.—A shock of earthquake, lasting ten seconds, was felt here this evening.

Frisco, Utah: two light shocks of earthquake occurred at this place between 1 and 2 a. m. on the 26th. The duration of each shock was about three seconds; they were accompanied by a rumbling noise which resembled that caused by a moving train.

FOREST AND PRAIRIE FIRES.

Frederick, Brown county, Dakota: during the 1st and 2d prairie fires burned over an area of one hundred square miles in an adjoining (McPherson) county, rendering many families homeless. The damage is estimated at \$250,000.

Battleford, Northwest Territory: extensive fires prevailed in the surrounding country on the 16th. Three dwellings, several out-buildings, and a large quantity of hay were destroyed.

Steele, Kidder county, Dakota: a prairie fire on the 16th destroyed considerable property to the west of this place.

Tracy, Lyon county, Minnesota: prairie fires destroyed property, valued at \$7,000, a few miles west of this place on the 16th.

Cheyenne, Wyoming: reports from Egbert, Laramie county, stated that extensive prairie fires prevailed in that vicinity on the 17th.

Huron, Dakota: five hundred tons of hay were destroyed by a prairie fire in Clay county on the 22d.

Prairie and forest fires have also been reported from the following places:

Bismarck, Dakota, 8th, 9th.

Forts Totten and Yates, Dakota, 10th.

Fort Buford, Dakota, 14th.

Pike's Peak, Colorado, southeast of station on the 15th.

Webster, Dakota, 15th.

Fort Sill, Indian Territory, 15th, 16th, 21st, 22d, 27th to 31st.

Fort Reno, Indian Territory, 31st.

Saint Vincent, Minnesota, 1st to 11th, 16th, 17th, 20th, 22d, 27th.

Moorhead, Minnesota, 8th.

Poplar River, Montana, 1st, 2d, 3d, 10th.

Fort Assinaboine, Montana, 3d to 10th, 21st, 22d, 23d.

Fort Maginnis, Montana, 19th.

North Platte, Nebraska, 7th, 8th, 9th.

Harvard, Nebraska, 22d.

Cheyenne, Wyoming, 4th.

INSECTS.

Atlanta, Georgia: grasshoppers, in large numbers, made their appearance in this vicinity on the 13th.

Spartanburg, South Carolina, 31st: grasshoppers, though not so numerous as in the preceding month, were observed in considerable numbers during October.

METEORS.

Oroville, Butte county, California: a large and brilliant meteor was observed eight miles northeast of this place at 7 p. m. on the 26th. It was first observed at an altitude of about 15°, and moving directly upward, it disappeared in the zenith, leaving a bright trail, apparently three hundred yards in length. The flight of the meteor was of about fifteen seconds' duration.

Mr. Arthur Betts, voluntary observer, at Webster, Day county, Dakota, reports the following:

On the 29th, at 4 p. m., a meteor was observed to flash across the northern heavens. It was first observed at an altitude of 30°, and moving slowly in an easterly direction it descended to the horizon, gradually diminishing in size during its flight. The nucleus, when first observed, was apparently as large as the disc of the sun. The sky was clear and the sun shining brightly at the time the meteor was observed. The duration of its flight was about twenty seconds.

Mr. P. A. Allen, chief engineer of the Peoria, Decatur and Evansville Railroad, reports having observed a similar phenomenon just after sunset on the same day, at a point about five miles south of Webster.

Harvard, Clay county, Nebraska: a large meteor was observed here at 8.40 p. m. on the 31st, moving across the sky in a northwesterly direction and exploding when at an altitude of 35°. During its flight a hissing noise was heard, and at its explosion a shower of sparks was observed.

Meteors were also observed at the following places:

Dakota.—Webster, 16th.

Florida.—Limona, 1st, 2d, 3d, 5th, 18th, 24th, 25th, 28th; Manatee, 1st, 14th, 16th, 28th.

Illinois.—Charleston, 4th, 27th, 30th; Anna, 27th.

Indiana.—Vevay, seven meteors, of the second magnitude, were noted on the 8th; a brilliant meteor was seen on the 21st; Terre Haute, 14th, 16th.

Indian Territory.—Fort Sill, 29th.

Iowa.—Independence, 26th.

Kansas.—Elk Falls, 5th, 9th; Allison, 22d.

Maine.—Buckfield, 27th.

Maryland.—Woodstock, 2d.

Massachusetts.—Rowe, 1st, 6th, 7th, 9th, 11th, 14th.

Nebraska.—Yutan, 8th, 9th, 16th; Crete, 13th, 31st.

New Jersey.—Beverly, 1st.

North Carolina.—Reidsville, 2d.

Oregon.—East Portland, 1st to 6th.

South Carolina.—Stateburg, 15th; Spartanburg, 13th.

Virginia.—Fort Myer, 10th, 17th; Dale Enterprise, 13th, 22d, 25th.

Washington Territory.—Dayton, 6th.

Wisconsin.—Embarras, 8th.

Wyoming.—Fort Bridger, 21st.

MIGRATION OF BIRDS.

Geese flying southward.—Montgomery, Alabama, 29th; Lead Hill, Arkansas, 3d; Red Bluff, California, 14th to 17th, 22d; Sacramento, California, 3d to 17th, 28th, 29th; New Haven, Connecticut, 12th; Fort Bennett, Dakota, 2d; Yankton, Dakota, 16th; Forts Sully and Yates, Dakota, 31st; Washington City, District of Columbia, 18th; Boise City, Idaho, 9th; Cairo, Illinois, 10th; Charleston, Illinois, 27th, 28th, Terre Haute, Indiana, 27th, 30th; Fort Sill, Indian Territory, 20th, 21st, 28th; Salina, Kansas, 2d; Yates Centre, Kansas, 3d, 8th, 19th, 22d, 25th; Westmoreland, Kansas, 7th; Allison, Kansas, 12th, 16th, 23d; Elk Falls, Kansas, 16th; Independence, Kansas, 17th; Fort Scott, Kansas, 22d; Liberty Hill, Louisiana, 24th, 25th, and 26th; Point Pleasant, Louisiana, 8th; Manistique, Michigan, 5th; Mottville, Michigan, 26th to 29th; Port Huron, Michigan, 29th; Moorhead, Minnesota, 13th; Saint Paul, Minnesota, 6th; Lamar, Missouri, 2d; Saint Louis, Missouri, 27th; North Platte, Nebraska, 3d; Yutan, Nebraska, 3d, 10th, 16th, 18th, 19th, 21st; Harvard, Nebraska, 2d, 24th, 28th; Omaha, Nebraska, 21st; Humphrey, New York, 18th, 21st; New River Inlet, North Carolina, 25th; Tiffin, Ohio, 27th; Garrettsville, Ohio, 30th; Roseburg, Oregon, 14th, 31st; Albany, Oregon, 15th, 22d; Chambersburg, Pennsylvania, 9th, 30th; Wellsborough, Pennsylvania, 9th, 17th, 18th, 31st; Block Island, Rhode Island, 8th; Chattanooga, Tennessee, 19th; Memphis, Tennessee, 28th; Indianola, Texas, 3d, 13th, 14th, 16th; Corsicana, Texas, 8th; Brownsville, Texas, 9th; Palestine, Texas, 17th; Bird's Nest, Virginia, 19th; Cape Henry, Virginia, 29th; Embarras, Wisconsin, 5th; Milwaukee, Wisconsin, 27th, 28th.

Geese flying northward.—Mobile, Alabama, 25th; Bismarck, Dakota, 8th; Guttenberg, Iowa, 25th; Cleveland, Ohio, 29th.

Ducks flying southward.—Little Rock, Arkansas, 14th, 21st; Elk Falls, Kansas, 18th; Yates Centre, Kansas, 18th, 31st; Liberty Hill, Louisiana, 13th, 19th; Point Pleasant, Louisiana, 19th; Yutan, Nebraska, 31st; Kitty Hawk, North Carolina, 18th, 24th, 27th; Indianola, Texas, 1st, 3d, 13th, 14th, 16th, 23d, 27th; Cape Henry, Virginia, 12th, 27th, 29th.

Ducks flying northward.—Mottville, Michigan, 27th, 30th.

Cranes flying southward.—Fort Bennett, Dakota, 2d; Fort Sill, Indian Territory, 16th, 20th; Allison, Kansas, 3d, 16th, 27th, 30th, 31st; Salina, Kansas, 2d; Yates Centre, Kansas, 10th; Elk Falls, Kansas, 29th; Point Pleasant, Louisiana, 24th; Harvard, Nebraska, 2d, 5th, 19th.

Brants flying southward.—Fort Buford, Dakota, 11th, 12th; Indianola, Texas, 16th, 29th.

POLAR BANDS.

Lead Hill, Arkansas, 4th, 21st.
Los Angeles, California, 4th.
Archer, Florida, 2d, 7th, 20th, 22d.
Riley, Illinois, 12th, 30th, 31st.
Guttenberg, Iowa, 3d.
Ninnescah, Kansas, 15th, 20th, 23d, 26th.
Thornville, Michigan, 17th.
Escanaba, Michigan, 17th, 18th, 27th.
Wauseon, Ohio, 15th, 25th.
Toledo, Ohio, 20th.
Nashville, Tennessee, 7th, 11th, 24th, 25th, 31st.
El Paso, Texas, 9th, 15th.
Bainbridge Island, Washington Territory, 15th.
Prairie du Chien, Wisconsin, 17th.
Fort Bridger, Wyoming, 19th, 25th.

SAND STORMS.

Fort Yates, Dakota, 4th, 8th.
Fort Sill, Indian Territory, 12th.
Fort Assinaboine, Montana, 3d.

WATER-SPOUTS.

The s. s. "Ailsa," J. W. Sansom, commanding, in N. 13° 18', W. 79° 54', passed a water-spout bearing west, two miles distant.

ERRATA.

On page 19 of the REVIEW for January, 1885, in the table of miscellaneous data, the departure from the normal temperature at Fort Concho, Texas, given as $-36^{\circ}.5$, should read $-6^{\circ}.5$.

On page 235 of the REVIEW for September, 1885, in the table of miscellaneous data, the altitude of El Paso, Texas, given as 6,764 feet, should read 3,764 feet.

Meteorological record of voluntary observers and Army post surgeons, October, 1885.

The maximum and minimum temperatures at stations marked thus (*) are from readings of other than standard instruments.

Stations.	Temperature.				Stations.	Temperature.			
	Maximum.	Minimum.	Mean.	Rainfall.		Maximum.	Minimum.	Mean.	Rainfall.
<i>Alabama.</i>	°	°	°	Inches	<i>Indiana.</i>	°	°	°	Inches
Birmingham *	80	32	56.6	1.37	Fort Wayne *	77	30	51.8	4.90
Greensborough *	81	42	61.5	1.37	Guilford *	74	30	51.2	2.58
Mount Vernon B'ks.	85	35	64.1	1.35	Jeffersonville *	78	34	52.5	4.28
<i>Arizona.</i>					Lafayette *	77	30	52.0	4.50
McDowell, Fort.	104	39	72.3	0.26	Lafayette *	77	30	52.0	4.50
Mojave, Fort	103	42	73.4	trace.	Logansport *	83	30	51.3	3.08
Tucson				0.00	Mauzy *	72	24	44.6	2.89
<i>Arkansas.</i>					Spiceland *	73	29	48.8	1.90
Lead Hill *	95	29	56.0	1.22	Sunman *	70	20	51.1	2.02
Mount Ida *	80	28	59.5	0.30	Terre Haute *	72	34	51.1	4.14
<i>California.</i>					Vevay *	78	32	53.9	2.62
Alcatraz Island	69	50	56.6	0.50	<i>Iowa.</i>				
Angel Island	80	51	60.3	0.63	Cedar Rapids *	72	24	45.0	2.50
Benicia Barracks	92	53	63.3	0.30	Cedar Rapids *	72	22	46.0	1.34
Bidwell, Fort	86	27	57.0	0.73	Cresco *	73	22	42.5	1.14
Cahuenga Valley				0.00	Des Moines *	80	23	48.2	.....
College City *	101	42	65.0	0.96	Guttenberg *	80	24	49.0	1.41
Gaston, Fort	91	28	60.9	0.31	Humboldt *	76	22	43.7	.....
Mason, Fort	71	51	58.6	0.42	Independence *	70	27	45.2	1.62
Murieta *	100	35	61.2	0.00	Indianola *	75	25	49.3	3.35
Oakland *	75	45	59.9	0.30	Logan *				4.20
Oroville *	94	52	69.2	trace.	Madison, Fort *	75	29	53.2	3.25
Poway *	97	41	63.4	0.06	Manchester *	78	27	47.9	1.48
Presidio of San F.	74	46	57.8	0.46	Monticello *	74	24	45.4	2.65
Sacramento *	90	30	64.4	trace.	Mount Vernon *	78	27	48.1	2.20
Salinas *	72	38	59.2	0.08	Muscataine *	80	26	47.6	2.80
San Rafael *	94	34	64.0	0.70	Oskaloosa *				44.9
Susanville				0.50	Oskaloosa *	75	36	51.1	.....
<i>Colorado.</i>					West Union *	73	20	42.7	0.93
Lewis, Fort	75	17	47.9	0.48	<i>Kansas.</i>				
Lyon, Fort	85	24	51.9	0.60	Allison *	93	25	49.8	2.31
Pueblo	81	30	50.2	0.57	Atchison *	79	28	50.9	3.75
<i>Connecticut.</i>					Elk Falls *				2.00
Bethel				4.75	Emporia *	80	28	51.1	1.28
Hartford	72	27	48.2	4.48	Fort Scott *	78	31	50.0	1.65
North Colebrook *	70	32	51.7	3.97	Independence *	84	30	54.4	1.79
Southington	73	27	49.2	3.55	Lawrence *	77	29	51.2	3.32
Voluntown *	72	30	51.0	5.25	Ninnescah *	90	34	51.7	2.03
<i>Dakota.</i>					Salina *	71	39	54.0	0.04
Abr. Lincoln, Fort.	84	13	43.6	0.70	Topeka *	88	26	54.1	2.40
Meade, Fort	81	22	48.3	0.74	Wellington *	81	25	53.8	2.41
Pembina, Fort	73	18	35.0	0.35	W. Leavenworth *	79	31	55.5	5.55
Randall, Fort	83	20	48.4	1.10	Westmoreland *	87	24	50.0	2.80
Richardson *	79	22	48.9	1.00	Wyandotte *	78	28	53.0	4.13
Siseton, Fort	80	12	42.0	0.70	Yates Centre *	82	26	50.5	3.00
Sully, Fort	86	21	47.7	0.03	<i>Kentucky.</i>				
Totten, Fort	80	22	40.5	0.63	Frankfort	77	32	53.4	4.78
Vermillion	84	23	48.3	0.98	Richmond	75	29	52.7	4.88
Webster *	83	21	45.3	0.79	<i>Louisiana.</i>				
Yates, Fort	87	8	43.9	0.44	Grand Coteau	80	42	65.7	0.56
<i>District of Columbia.</i>					Liberty Hill *	76	54	66.7	1.80
Distributing Res'rs	75	35	56.4	9.57	Luling *	80	37	62.2	0.00
Receiving Res'rs *	75	37	55.9	10.88	Point Pleasant *	82	40	60.4	1.22
Rock Creek Bridge *	78	39	59.1	.....	<i>Maine.</i>				
West Washington	77	37	57.8	8.77	Buckfield	69	28	46.4	3.64
<i>Florida.</i>					Cornish *	66	27	47.6	3.94
Archer	88	44	68.9	4.77	Gardiner	61	25	45.5	4.04
Limosa *	86	50	70.2	1.95	Orono *	70	23	49.5	5.12
Manatee *	88	55	72.6	1.26	Preble, Fort	65	30	50.2	1.31
Mayport	86	58	71.7	5.38	<i>Maryland.</i>				
Meade, Fort				1.19	Cumberland	75	32	51.0	4.14
Merritt's Island	87	56	73.1	4.61	Fallston *	75	37	53.3	7.07
Saint Augustine, Ft	84	54	69.9	3.32	Great Falls *	75	32	54.0	8.23
Tallahassee *	83	40	65.0	1.35	McDonogh	72	33	53.2	6.38
<i>Georgia.</i>					McHenry, Fort	74	38	57.6	5.83
Athens	78	34	56.8	4.89	Woodstock	72	30	51.9	10.23
Forsyth *	82	42	61.7	4.10	<i>Massachusetts.</i>				
Milledgeville *	78	38	60.8	4.80	Amherst *	71	31	49.0	4.12
<i>Illinois.</i>					Amherst *	80	24	49.1	3.65
Anna	80	36	54.6	3.43	Blue Hill	70	29	48.8	5.92
Bunker Hill *	84	30	53.7	4.89	Deerfield	78	24	49.5	6.48
Collinsville	77	33	51.0	8.52	Dudley	72	32	54.5	3.74
Charleston *	79	28	50.8	3.24	Fall River *	70	32	52.1	4.45
Geneseo				1.20	Heath *	78	26	51.0	.....
Mattoon *	81	29	53.0	4.60	Mendon *	70	29	53.4	.....
Peoria *	75	30	52.3	2.32	New Bedford	70	30	51.3	4.06
Riley *	69	24	44.8	2.57	Princeton	70	37	47.4	4.66
Rockford *	70	25	45.0	3.95	Rowe *	70	30	45.2	4.08
Sandwich *	74	29	49.6	2.14	Somerset *	76	32	53.4	4.34
South Evanston	70	29	49.6	3.51	Taunton	75	29	51.4	3.85
Sycamore	72	25	44.8	4.05	Westborough *	78	28	51.8	4.48
Windsor *	78	25	50.3	4.19	Worcester *	70	30	47.5	4.81
					Williamstown	72	26	47.0	3.12

Meteorological record of voluntary observers, etc.—Continued.

Stations.	Temperature.			Rainfall.	Stations.	Temperature.			Rainfall.
	Maximum.	Minimum.	Mean.			Maximum.	Minimum.	Mean.	
<i>Michigan.</i>	°	°	°	<i>Inches</i>	<i>Ohio—Continued.</i>	°	°	°	<i>Inches</i>
Birmingham	72	21	43.3	1.51	Hiram	75	33	45.4	5.19
Brady, Fort	67	12	43.3	2.45	Jacksonborough	80	24	50.7	2.00
East Saginaw	75	15	40.4	3.15	Napoleon	76	15	48.4	2.78
Harrieville	67	20	43.5	4.35	North Lewisburg	79	21	52.0	2.20
Hudson	77	13	45.0	4.66	Portsmouth	78	25	51.5	3.69
Lansing	73	18	45.4	3.60	Tiffin	78	30	49.8	2.31
Manistiquie	68	22	42.7	2.53	Wauson	78	14	46.9	3.03
Mottville	72	25	48.0	5.50	Westerville	74	23	48.8	2.83
Pontwater	72	18	44.0	3.30	Yellow Springs	74	22	49.4	2.62
Thornville	70	24	48.0	2.26	<i>Oregon.</i>				
Traverse City	75	18	46.5	2.82	Albany	84	36	56.3	1.75
<i>Minnesota.</i>					Bandon	71	33	50.1	2.45
Minneapolis	78	24	42.5	1.76	East Portland	78	30	50.0	1.15
Northfield	77	23	43.6	2.04	Eola	77	39	55.6	1.42
Snelling, Fort	81	22	43.8	1.70	<i>Pennsylvania.</i>				
<i>Missouri.</i>					Altoona	78	30	52.5	3.61
Carthage	83	29	54.9	1.90	Blooming Grove	75	24	48.0	7.70
Centerville	94	23	48.3	1.71	Catawissa	80	32	55.8	5.65
Conception	77	29	43.0	4.83	Chambersburg	79	36	49.3	4.64
Independence	70	25	50.0	2.84	Drifton	77	27	48.7	5.66
Springfield	80	25	47.5	1.75	Dyberry	72	20	45.0	3.52
<i>Montana.</i>					Easton	83	39	56.5	5.37
Assinaboine, Fort	85	14	46.7	0.00	Easton	83	39	56.5	5.37
Ellis, Fort	82	22	45.8	1.50	Fallingston	75	34	51.0	4.23
Keogh, Fort	80	12	47.6	0.94	Franklin	72	22	42.1	4.50
Shaw, Fort	75	21	47.3	0.94	Germantown	74	33	51.5	5.58
<i>Nebraska.</i>					Grampian Hills	78	20	44.4	2.92
Cretes	82	23	47.2	1.07	Mahanoy Plane	74	35	52.1	5.54
De Soto	83	23	48.4	2.01	Quakerstown	72	26	49.0	4.29
Fairbury	88	24	47.9	1.81	South Bethlehem	82	30	51.0	5.82
Freemont	81	24	47.9	3.81	Tidoute	87	26	49.6	4.54
Genoa	82	23	48.0	1.60	Troy	80	27	47.0	5.74
Harvard	92	24	48.0	4.00	Washington	75	28	48.0	4.80
Marquette	76	26	49.4	2.86	Wilkes Barre	83	30	49.6	4.65
Robinson, Fort	86	9	49.4	1.80	Wellsborough	78	36	50.3	7.50
Stockham	84	25	53.0	3.25	West Chester	75	33	52.2	6.25
Tecumseh	82	25	53.0	3.25	Wyox	77	28	52.5	6.63
Yutan	80	31	48.0	2.30	<i>South Carolina.</i>				
<i>Nevada.</i>					Kirkwood	68	34	53.8	2.89
Carson City	86	23	52.1	0.12	Pacolet	68	41	50.2	7.50
McDermitt, Fort	86	26	55.2	0.12	Spartanburg	56	12	40.47	5.30
<i>New Hampshire.</i>					Stateburg	77	40	59.8	3.52
Antrim	76	26	48.3	4.15	<i>Tennessee.</i>				
Ashland	76	26	48.3	4.15	Ashwood	76	32	54.0	3.23
Belmont	76	26	48.3	4.15	Austin	78	32	55.9	3.21
Bristol	76	26	48.3	4.15	Milan	84	31	55.2	2.89
Contoocook	76	26	48.3	4.15	<i>Texas.</i>				
Lake Village	76	26	48.3	4.15	Austin	84	42	66.2	2.82
Nashua	76	26	48.3	4.15	Brown, Fort	93	55	74.3	9.75
Wier's Bridge	76	26	48.3	4.15	Cleburne	81	34	63.0	0.47
Wolfborough	76	26	48.3	4.15	Comfort	76	30	52.0	0.73
Woodstock	76	26	48.3	4.15	Concho, Fort	94	37	66.0	0.00
<i>New Jersey.</i>					Corpus Christi	91	54	66.0	0.00
Beverly	78	34	53.8	3.51	Coriscana	86	43	66.4	1.93
Dover	77	29	47.1	5.75	<i>Vermont.</i>				
Moorestown	81	31	51.9	3.48	Brattleborough	63	26	48.0	4.74
Princeton	80	32	51.4	3.29	Burlington	75	24	48.8	4.77
Readington	78	30	50.2	5.80	Charlotte	71	22	47.2	7.20
Somerville	75	33	51.8	4.65	Dorset	76	19	45.2	2.52
South Orange	70	34	52.2	4.35	Lunenburg	74	21	45.7	4.41
Pierce City	82	29	54.3	1.40	Newport	70	22	45.7	6.41
Vineland	77	39	54.7	5.83	Post Mills Village	75	21	44.1	0.00
<i>New Mexico.</i>					Stowe	70	20	47.9	7.69
Gallinas Spring	82	34	58.0	0.35	Strafford	70	24	47.9	5.90
Union, Fort	80	24	51.5	0.86	Woodstock	75	23	44.8	4.70
<i>New York.</i>					<i>Virginia.</i>				
Auburn	74	24	51.4	3.95	Accotink	80	34	56.2	6.97
Columbus, Fort	75	33	54.5	4.83	Blr's Nest	85	41	62.1	2.35
Cooperstown	70	20	46.3	4.19	Blacksburg	70	28	51.8	6.64
David's Island	77	35	54.3	4.33	Bringington	72	41	57.2	4.55
Factoryville	78	28	48.4	5.60	Christiansburg	72	41	57.2	4.55
Humphrey	75	32	47.2	4.17	Dale Enterprise	78	35	56.0	12.60
Ithaca	77	26	48.5	5.20	Marion	69	28	50.5	4.28
Madison Barracks	73	17	47.7	3.69	Monroe, Fort	80	41	60.2	0.62
Menand Station	72	28	49.3	5.38	Snowville	70	28	52.0	6.20
Mountainville	70	29	49.8	6.09	Summit	79	30	54.2	0.00
Niagara, Fort	75	31	49.4	3.20	Variety Mills	73	28	52.0	10.76
North Volney	75	22	46.7	3.70	Wytheville	70	31	51.4	4.69
Palermo	70	21	46.1	3.13	<i>Washington Territory.</i>				
Palmyra	80	28	54.0	2.59	Bainbridge Island	68	35	52.0	4.40
Penn Yan	67	24	46.0	4.57	Kenewick	83	24	50.0	0.26
Plattsburg Bks	73	23	53.6	5.80	Pleasant Grove	83	19	50.0	0.06
White Plains	72	33	53.5	8.40	Tacoma	64	39	51.4	2.47
<i>North Carolina.</i>					Townsend, Fort	69	30	53.5	1.00
Asheville	77	30	51.0	8.30	<i>West Virginia.</i>				
Flat Rock	68	31	49.8	12.85	Helvetia	72	29	47.5	5.80
Lenoir	68	32	49.0	9.50	Parkersburg	76	32	49.1	2.13
Lincolnton	66	37	52.3	5.44	Wellsburg	70	30	54.2	4.67
Raleigh	78	38	59.0	3.80	<i>Wisconsin.</i>				
Reidsville	68	30	54.2	0.00	Embarras	76	26	45.4	3.40
Statesville	73	33	57.0	7.43	Evansville	75	30	51.0	0.00
Wake Forest	70	37	56.6	3.67	Madison	71	26	44.8	2.37
Weldon	78	37	57.7	5.11	Manitowoc	67	24	45.4	3.17
<i>Ohio.</i>					Neillsville	68	7	38.3	0.50
Cleveland	78	33	50.5	3.85	Prairie du Chien	77	25	45.5	1.72
Clyde	78	30	52.6	2.68	Wausau	73	13	40.6	0.95
College Hill	81	29	52.6	4.00	<i>Wyoming.</i>				
Garrettsville	76	24	46.4	4.29	Bridge, Fort	74	16	44.3	0.50
					Fred Steele, Fort	75	11	44.2	0.14

NOTES AND EXTRACTS.

The following is an extract from the October, 1885, report of the "Alabama Weather Service," under direction of Prof. P. H. Mell, jr., Auburn:

The first part of the month of October was mild and pleasant, and no sudden or unusual changes occurred. Towards the close the temperature fell several degrees, and slight frosts were recorded on the 22d, 23d, and 31st. Some few stations in north Alabama reported thin ice about the same time. The average temperature for the month was 5° below the normal.

The average precipitation for Alabama was slightly above the normal, and the distribution throughout the month was quite uniform, so that the dry, unhealthy condition of the atmosphere so prevalent during September and October of last year was avoided.

Some stations reported red sunsets during the month. Tusculumbia furnished the following: "The sunrise on the 31st was bright and magnificent. At sunset there was a grand and magnificent display; the sky was bright red, and the rays of light shot up from the entire western horizon, brilliant and grand as an aurora. Thus, at the close of the month, the day went out in a blaze of glory."

Summary.

Mean temperature, 60°; highest temperature, 86°, at Pine Apple, on the 3d; lowest temperature, 26°, at Gadsden, on the 22d; range of temperature, 60°; greatest monthly range of temperature, 58°, at Pine Apple; least monthly range of temperature, 30°, at Edwardsville; least daily range, 18°; greatest daily range of temperature, 44°, at Pine Apple, on the 24th; least daily range of temperature, 0°, at Prattville, on the 29th, and at Union Springs, on the 11th.

Mean depth of rainfall, 2.59 inches; mean daily rainfall, 0.08; greatest depth of monthly rainfall, 5.08 inches, at Auburn; least depth of monthly rainfall, 0.30, at Selma; greatest daily rainfall average for state, 0.58 of an inch, on the 29th; greatest daily local rainfall, 1.95 inches, at Union Springs, on the 1st; average number of days on which rain fell, 6.

Average number of cloudy days, 8; average number of fair days, 8; average number of clear days, 15; warmest days, 1st, 17th, 18th; coldest day, 22d.

Prevailing direction of wind, northwest.

The following meteorological summary and accompanying remarks are from the October, 1885, report of the "Indiana Weather Service," under direction of Prof. W. H. Ragan, of De Pauw University, Greencastle:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly means.	
	°	°	°	<i>Inches.</i>
Northern counties	83.0	22.0	49.2	4.35
Central counties	78.0	24.0	48.8	3.20
Southern counties	85.0	26.0	51.8	2.95
State	85.0	22.0	49.9	3.52

The mean temperature for October, 1885, for the state was 8° below the mean for 1882; 4° below that for 1883; 7° below that for 1884; and 5° below the normal. At Logansport it was 1° below the normal for a period of twenty-nine years; at Spiceland, 2° below the normal for thirty-one years; and Indianapolis, 4° below the normal for fifteen years. The warmest days were the 1st, 2d, 17th, 18th, and 25th; the coldest were the 7th, 21st, 22d, 23d, 24th, and 31st. The highest monthly mean temperature, 53° 9, is reported from Vevay; the lowest, 44° 6, is reported from Maury.

The precipitation was unevenly distributed through the month and over the state, the greatest amount falling on the 19th. It was greatest for the northern stations and least for the southern stations.

The following meteorological summary and accompanying remarks are from the October, 1885, report of the "Indiana Weather Service," under direction of Prof. H. A. Huston, of Purdue University, Lafayette:

Districts.	Temperature.			Average precipitation.
	Highest.	Lowest.	Monthly means.	
	°	°	°	<i>Inches.</i>
Northern counties	83.0	28.0	49.50	3.36
Central counties	83.0	24.0	48.95	2.89
Southern counties	85.0	29.0	52.08	2.92
State	85.0	24.0	50.16	3.06

The mean temperature of the state for October is 7° 18 below that for October of last year, 5° 17 below the mean of fourteen years at Indianapolis, 5° 57 below the mean of twenty-six years at Logansport, 6° 04 below the mean of twenty-one years at Vevay, 1° 64 below the mean of thirty-one years at Spiceland, 3° 24 below the mean of six years at Maury, 8° 11 below the mean of four years at Blue Lick, 6° 64 below the mean of four years at Worthington,

and 2°.83 below the mean of six years at this station. The mean temperatures at the various stations are below the normal, the amounts ranging from 2° to 9°.

The mean precipitation for the state is 0.48 inch above that for last year; 0.44 below the mean of fourteen years at Indianapolis, 0.28 above the mean of twenty-six years at Logansport, 0.41 above the mean of twenty-one years at Vevay, 0.66 above the mean of twenty-six years at Spiceland, 0.57 below the mean of six years at Maury, 0.92 below the mean of four years at Blue Lick, 1.08 below the mean of four years at Worthington, and 0.32 below the mean of six years at this station. The rainfall in southern counties has been nearly normal, in central counties about 0.5 inch below the normal, and northern counties nearly an inch above the normal. The barometer is slightly below the normal.

Lunar halos are reported on seven different dates. October snows have fallen ten years in twenty-six, the heaviest being 6.45 inches in 1869.

The following is an extract from the October, 1885, report of the "Minnesota Weather Service," under direction of Prof. Wm. W. Payne, Northfield:

Reports from seventeen stations of the Minnesota Weather Service give an average mean temperature for Minnesota for October of 42°.7. This is 16°.0 colder than the preceding month of September. The warmest station was La Crosse, with a mean for the month of 46°.7. The next warmest was Winona, 45°.4. The coldest station was Park Rapids, Hubbard county (37°.7), only a few miles south of the forty-seventh parallel, and situated on the elevated watershed from whence the Mississippi and Red River of the North take their rise. The next coldest was Saint Vincent, in the extreme northwest, with a mean for the month of 40°.0.

The minimum degree of heat (12°.0) was also observed at Park Rapids on the morning of the 4th.

In the northwest the highest temperatures were recorded on the 10th; in the southwest on the 16th.

The greatest degree of heat was at Moorhead, 83°.9; the next highest, at Morris, 81°.0, on the 10th.

October this year has been a cold month, the mean temperature being much below the normal throughout the state, except in the Upper Red River Valley, where the month has been from 1°.5 to 3°.0 above the normal. At Duluth, St. Paul, and La Crosse the month was colder than October, 1884, by averages of 4°.0, 8°.6, and 7°.4, respectively. The low mean of the month is due more to the uniformly low temperatures rather than to extremes, of which indeed there was a noticeable absence, the temperature rarely falling 20°.0 at any station in the state. The warmest days were the 1st, 2d, 9th, 10th, 16th, 24th, and 25th. The coldest were the 4th, 5th, 19th, 20th, 21st, 22d, 23d, 28th, and 29th. Minimum temperatures of 20°.0, or below, were registered west of a line drawn from Sherburne, Martin county, northeast to Aitkin, Aitkin county. Frosts were frequent and severe, being incident to nearly every day of the month.

Sherburne, 4th.—Heavy frost, temperature, 20°.0 between daylight and sunrise.

The rainfall for October has been deficient in amount to a marked degree throughout all parts of the state. All stations in the north and west report less than one inch for the month. In the southeast, with the exception of the immediate vicinity of the Mississippi River, the precipitation has slightly exceeded one inch. The largest amount recorded was at Northfield, 2.04 inches. The least amount was at Wadena, where the amount for the month was too small for measurement. The average for the state was only 0.92 inch.

The dryness of the ground has interfered to some extent with fall plowing, but at the end of the month the land, especially in the Red River Valley, was all prepared under the most favorable conditions for the next season's crop of grain. Thin ice formed on many nights, but even in the more northerly districts the frost was at no time sufficiently severe to interfere with agricultural work. Water has been very scarce in western Minnesota, and many wells have altogether failed. The streams and rivers are very low, and there is a well-grounded apprehension that unless the November rains and snows are abundant there will be a great scarcity of water for manufacturing and other purposes. The rainfall has been especially deficient for September and October at the headwaters of the Mississippi River, and, as a consequence, the river will probably be at a very low stage during the coming winter.

The following is an extract from the October, 1885, report of the "Missouri Weather Service," under direction of Prof. Francis E. Nipher, Saint Louis:

At the central station the mean temperature of October has been slightly below the normal, but at no time has the temperature of the air fallen lower than 36°. In former years the temperature of the air at Saint Louis has once fallen below the freezing point as early as October 4th (1836).

The month opened with light rains in the early part of the first decade, clearing on the fifth, with slightly falling temperature. The average temperature of the first decade was 56°.5, which was one degree above the average for the entire month. The second decade was about two degrees above the average for the month, with a rain of over two inches on the 13th and 14th, and a heavy local rain of 3 inches on the night of the 27-28th.

In the state the temperature of the air has fallen to, or below, 32° at all stations, excepting Hannibal (33°) and Cairo, Illinois (38°.8). The lowest temperatures reported are 18° (possibly 28°), at Graham; Kirksville, 26°; Ironton, 27°; Steelville and Sedalia, 28°.

The rainfall has been less than 2 inches in the extreme southern part of the state and over the entire drainage area of the Osage River, and extending eastward of the mouth of the Osage along the lower Missouri valley to near Saint Charles. To the eastward of Saint Charles the rainfall increases very rapidly, being seven inches at the central station. In the northwest part of the state the rainfall increases to over 5 inches.

The following is an extract from the October, 1885, report of the "Nebraska Weather Service," under direction of Prof. Goodwin D. Swezey, of Doane College, Crete:

The temperature of the month has been a few degrees below the normal, with an unusually large number of frosts and cold nights. Hail and thunderstorms have naturally been less in proportion, no hail being reported, and only one or two thunderstorms.

The amount of precipitation, and also the number of rainy days and of fogs, has been nearly normal. A slight fall of snow occurred in the northern part of the state on the 18th. The amount of cloudiness is quite below the normal.

The average rain for the different sections of the state for October, 1885, is as follows: Northeast section, 2.51 inches; southeast section, 2.71; northwest section, 1.36; southwest section, 2.44.

The following is an extract from the October, 1885, "Bulletin of the New England Meteorological Society," under direction of Prof. Winslow Upton, Providence, Rhode Island:

General conditions.—Fair weather characterized the month, the rains, though abundant in quantity, having been confined to a small number of days. Frosts were numerous, but the agricultural season closed with the minimum of damage from this cause.

Precipitation.—The rainfall for the month was largely in excess of the average. The chief peculiarity of the record is that the rains in each of the four general storms of the month were large, though irregularly distributed. The fall on the 6th instant was light, and at a few stations, mostly in New Hampshire and Vermont, none was reported. Excessive rainfalls were: Newport, Vermont, 3.11 inches, 21st; Providence, 3.62 inches, 13-14th; Saint John, 3.72 inches, 29-30th. Snow was noted at a very few stations.

Temperature.—The temperature averages 0°.4 below the normal. There were no extremes of temperature; the highest temperatures were generally noted the first of the month, and the lowest near the close.

Pressure.—Five barometric depressions passed near the district on the 4th, 6th, 14th, 21st, and 30th, respectively. Of these, the first and third moved from the Lakes down the Saint Lawrence Valley, the latter having moved northwesterly from the eastern Gulf states before pursuing its northeasterly path. The fifth moved southeasterly from Nebraska to Tennessee, where it turned northeasterly and passed along the coast. These three depressions were all attended by heavy rains and high winds, and by thunder and lightning, which was especially marked in the first. Thus, on the 3d instant, thunder was noted at Setauket, 4.30 a. m., Providence, 10.20 a. m., Gardiner, 3 p. m., Saint John, 9 p. m., and at other stations at intermediate times. On the 4th the northern stations, and a few near the coast, report thunder and lightning at varying hours in the afternoon. On the 14th a few coast stations reported lightning in the evening, and on the 29th thunder and lightning were noted in the evening at a few stations in Connecticut. The storm of the 3d was very severe in southern Rhode Island.

The following is an extract from the October, 1885, report of the "Ohio Meteorological Bureau," under direction of Prof. B. F. Thomas, of the Ohio State University, Columbus:

The mean atmospheric pressure for October, 1885, is considerably lower than for the same month of the two preceding years, and it is very remarkable when the mean temperature is considered, which is much lower than that of the years 1883 and 1884. The maximum pressure was .242 of an inch lower than 1883, and .153 lower than 1884. The minimum is lower than that of 1884, but higher than that of 1883.

The mean humidity was very nearly the average of the past three years. The most noticeable feature of the weather was the low mean temperature for the month, this being 49°.9. The normal for the month is 52°.3. The mean for October, 1885, is 3°.5 lower than that of 1883, and 6°.4 lower than that of 1884. The maximum temperature for the month, 83°.0, is 4°.0 lower than that of 1883, and 16°.0 lower than that for the same month of 1884. The minimum was also lower for this year. The minimum for October, 1883, was 25°.0, for 1884, 18°.0, for 1885, 14°.0, thus making it 11°.0 lower than 1883, and 4°.0 lower than 1884. Thus it is seen that October, 1885, is the coldest October that has been reported by the bureau.

The mean rainfall for the month, 3.30 inches, is .57 of an inch above the normal, and almost exactly the mean for October of the last three years. The rainfall for the month was evenly distributed throughout the month, no large rainfall being reported on any one day.

State summary for October, 1885.

Mean barometer, 29.997 inches; highest barometer, 30.399 inches, at Dayton, on the 9th; lowest barometer, 29.441, inches, at McConnellsville, on the 29th; range of barometer, .958 inch.

Mean relative humidity, 78.8 per cent.

Mean temperature, 49°.9; highest temperature, 83°.0, at Hanging Rock, on the 18th; lowest temperature, 14°.0, at Wauseon, on the 31st; range of temperature, 69°.0; mean daily range of temperature, 20°.4; greatest daily range

of temperature, 45°.0, at College Hill, on the 10th, and at Hanging Rock, on the 18th; least daily range of temperature, 4°.5, at Napoleon, on the 6th.

Average number of clear days, 9.0; average number of fair days, 8.5; average number of cloudy days, 13.5; number of days on which rain fell, 12.2.

Mean rainfall, 3.30 inches; average daily rainfall, .106 inch; greatest rainfall, 5.29 inches, at New Alexandria; least rainfall, 1.56 inches, at Sidney.

Prevailing direction of wind, southwest.

The following is an extract from the Tennessee "State Board of Health Bulletin," for October, 1885, prepared under direction of J. D. Plunkett, M. D., President of the State Board of Health. The summary is prepared by Major H. C. Bate, in charge of the State Meteorological Service:

The meteorological features for October were, for the most part, unimportant. The weather during the greater portion of the month was remarkably pleasant.

The mean temperature for the month was 54°.44, which was considerably below the mean for October of the two years previous, being 9°.29 below that in 1884, and 7°.78 below that in 1883. The mean of maximum temperature was 77°.06, and the mean of minimum temperature was 33°.12, respectively 14°.94 below and 4°.12 above those for October of last year. The range of temperature was 23° less than in October last year, and 10° less than in October, 1883. The highest temperature was recorded about the 17th and 18th, and was 14° lower than the maximum during the corresponding period last year. The lowest temperature was recorded on the 22d, and was only 1° above the minimum of October of last year. The average precipitation for the month was 3.73 inches, only .07 inch less than that for October of last year. In this, the eastern division received a large proportion, having an average fall of nearly six inches; the middle division having a little more than three inches, and the western division a little more than two inches. The days of the greatest rainfall were the 1st, 2d, 3d, 12th, 19th, 28th, and 29th, and of these the greatest fall occurred on the 29th, the same date as the greatest fall during September. As in the month previous, some of the local rainfalls were quite heavy, the greatest being 3.20 inches, reported at Fostoria. More than two inches were reported from several other stations in the eastern division. The greatest rainfall during the month was 7.86 inches, reported at Knoxville, and was the greatest October rainfall at that station in fifteen years, the next greatest being 6.40 inches in October, 1878. The above-named were general rains, except that of the 19th, which was confined to the middle and western divisions.

The rain of the 28th, was heaviest in the western division. Many of the rains were very light showers. The rainless days were the 7th, 8th, 9th, 15th, 21st, 22d, and 24th.

State summary.

Mean temperature, 54°.44; highest temperature, 85°, on the 18th, at Somerville;

lowest temperature, 30°, on the 22d, at Rogersville, Andersonville, Fostoria, Cookeville, Manchester, Beech Grove, Riddleton, Hurricane Switch, and Trenton; range of temperature, 54°; mean monthly range of temperature, 44°; greatest monthly range of temperature, 53°, at Milan and Covington; least monthly range of temperature, 30°, at Greenville; mean daily range of temperature, 18°; greatest daily range of temperature, 39°; on the 24th, at Beech Grove; least daily range of temperature, 2°, on the 1st, at Careyville; on the 2d, at Paris; on the 3d, at Jonesborough, Riddleton, and Dickson; on the 13th, at Cookeville and Ashwood; on the 20th, at Bolivar, and on the 29th, at Austin; mean of maximum temperatures, 77°.06; mean of minimum temperatures, 33°.12.

Mean depth of rainfall, 3.73 inches; mean daily rainfall, 0.12 inch; greatest rainfall, 7.86 inches, at Knoxville; least rainfall, 0.89 inch, at Somerville; greatest local daily rainfall, 3.20 inches, on the 29th, at Fostoria; days of greatest rainfall, 1st, 2d, 3d, 12th, 19th, 28th, 29th; day of greatest rainfall, 29th.

Average number of days on which rain fell, 8; average number of clear days, 12.7; average number of fair days, 9; average number of cloudy days, 9.3; rainless days, 7th, 8th, 9th, 15th, 21st, 22d, 24th; warmest days, 17th, 18th; coldest day, 22d.

Prevailing wind, northwest.

Table showing average amount of ozone reported from thirteen stations for the month of October, 1885.

Stations.	Mean of day observation.	Mean of night observation.	Highest.	Date. A. M.	Highest.	Date. P. M.
Rogersville	3.26	3.66	7	12 ^h	8	13 ^h , 14 ^h .
Careyville	3.20	2.97	6	23 ^h	6	23 ^h , 20 ^h , 28 ^h , 31 ^h .
Cookeville	0.76		10	21 ^h , 29 ^h , 30 ^h , 31 ^h	8	20 ^h , 29 ^h .
McMinnville	2.80	4.13	8	29 ^h	7	14 ^h , 31 ^h .
Riddleton	4.13	4.10	7	1 ^h , 2 ^h , 3 ^h , 15 ^h	8.5	31 ^h .
Florence Station	5.24	3.95	9	28 ^h	3	3 ^h , 5 ^h .
Nashville	0.74	0.58	6	4 ^h	7	28 ^h .
Hurricane Switch	3.81	3.56	5	20 ^h , 29 ^h	6	27 ^h , 29 ^h , 31 ^h .
Ashwood	2.70	2.70	5	20 ^h , 29 ^h	1	19 ^h , 20 ^h , 21 ^h , 22 ^h , 30 ^h , 31 ^h .
Dickson	1.06	0.35	4	21 ^h	8	27 ^h , 28 ^h .
Milan	4.40	3.07	7	21 ^h	8	28 ^h , 29 ^h .
Trenton	4.71	3.52	8	20 ^h	1	8, 20, 22.
Memphis	0.65	0.12	2	21, 23		

State of weather indicated thus: * Clear; † Fair; ‡ Cloudy; § Rain. a, 1st to 15th; b, 17th to 31st; c, 16th to 31st; d, 15th to 31st; e, 26 days.

Chart I. Tracks of Areas of Low

Form 100 G 1914

WAR DEPARTMENT
SIGNAL SERVICE

PUBLISHED BY ORDER OF
SECRETARY OF WAR
W. B. HAZARD
Brig. and Bvt. Maj. Gen.
Chief Signal Officer

Observations for the Signal Service
taken at 7 A.M. 3 P.M. 11 P.M.
75th Meridian Time

NOTES.

The Roman letters show number and order of areas of low pressure. The figures above the lines show the days of the month, those below (1, 2, and 3) indicate, respectively, the 7 a. m., 3 p. m., and 11 p. m. (75th meridian time) observations. The small circles on the lines indicate the position of the centre of the area of low barometer on the day and report, written respectively above and below the line.

The shaded spots () indicate positions of icebergs observed.

West from 3 Washington East 2 from Washington 7

s of Low Pressure. October, 1885.

MENT WEATHER MAP

ED BY ORDER OF THE
ETARY OF WAR.

B. HAZEN.
Maj. Genl. U. S. Army
Signal Officer

For the Signal Service are
7 AM 3 PM & 11 PM
Mean Solar Time

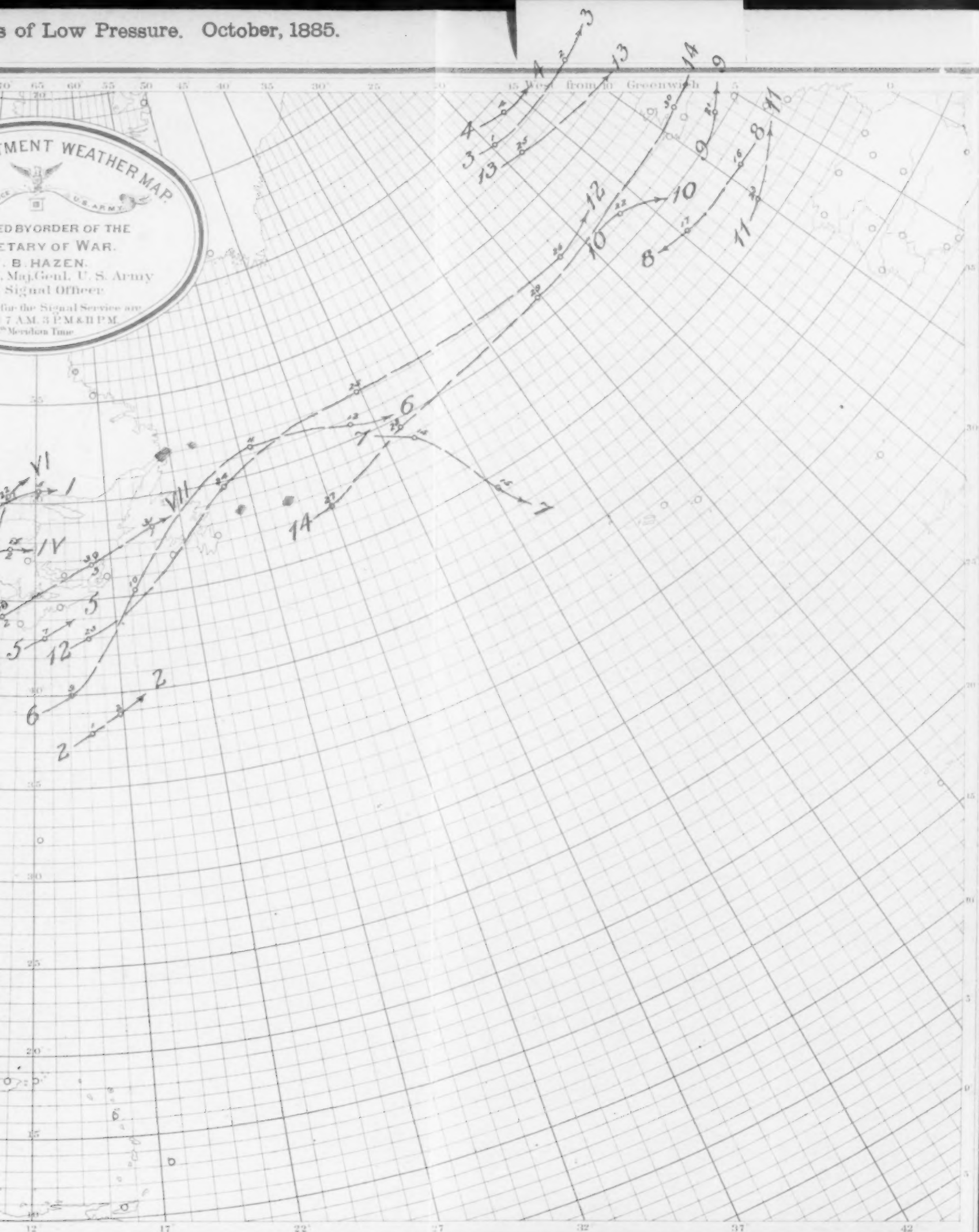


Chart II. Isobars, Isotherms, and Winds, October, 1885.

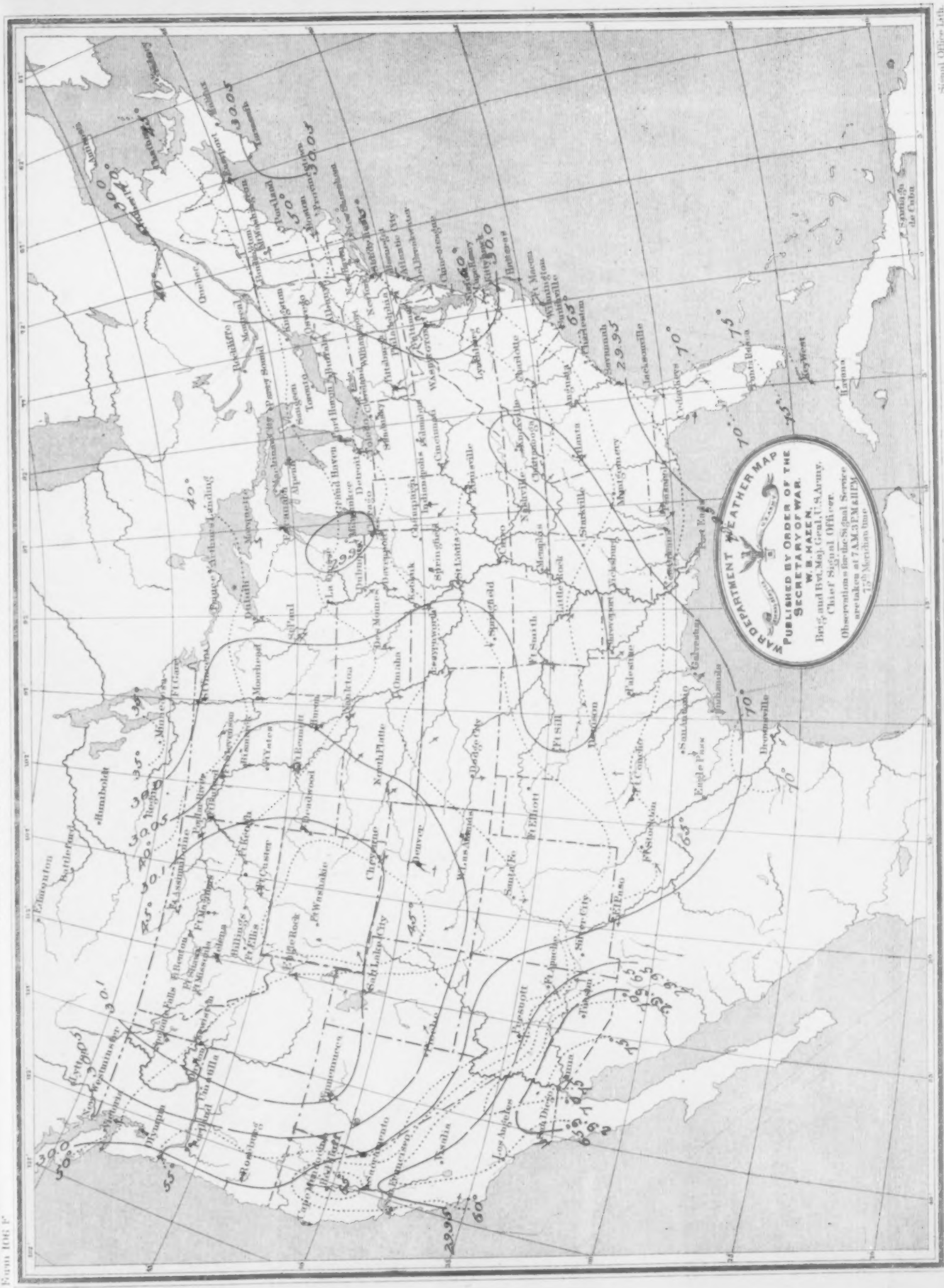
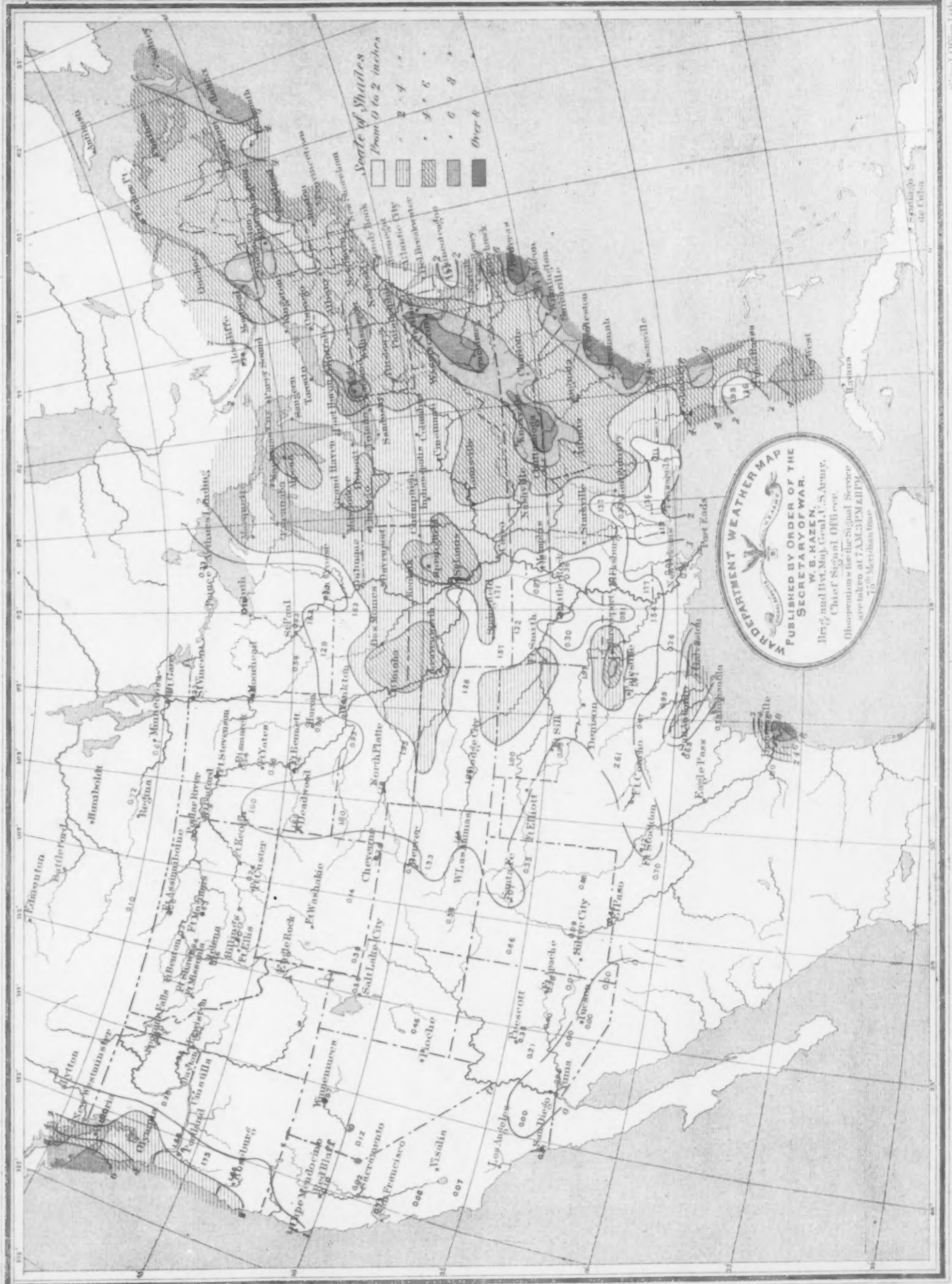
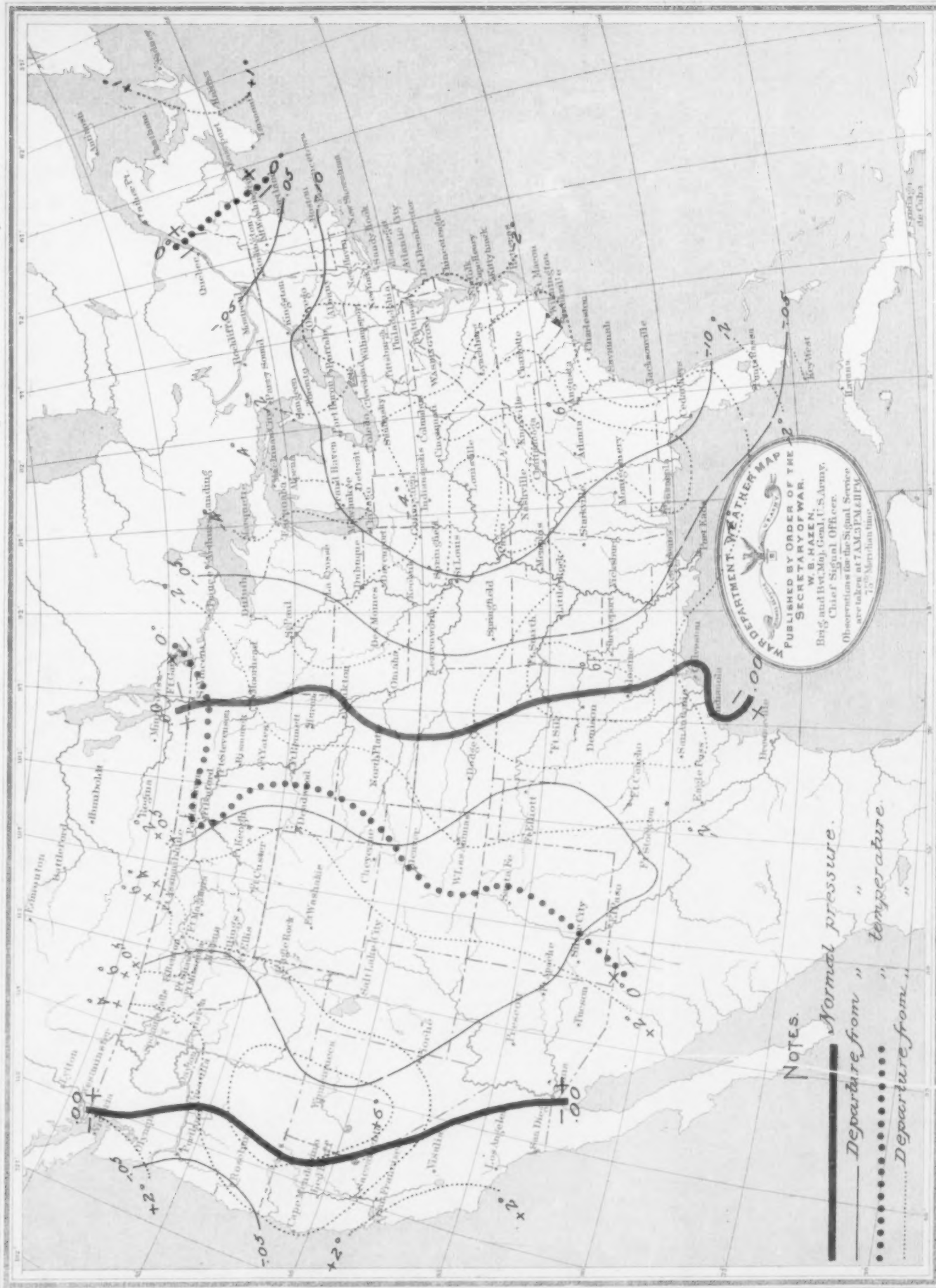


Chart III. Precipitation, October, 1885.

Form 106 F.





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Voluntary observers of the Signal Service, on land, from whom meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for October, 1885.

<i>Observer and place of observation.</i>	<i>Observer and place of observation.</i>	<i>Observer and place of observation.</i>	<i>Observer and place of observation.</i>
Alexander, S., Birmingham, Mich.	Dunton, Lieut. W. R., Dorset, Vt.	James, John W., Marengo, Ill.	Slenker, Mrs. E. D., Snowville, Va.
Anderson, Dr. W. W., Stateburg, S. C.	Douglas, Dr. B. H., Ashville, N. C.	Jones, Dr. E. U., Taunton, Mass.	Scribner, H. F. J., Stratford, Vt.
Altamier, J. M., Independence, Kans.	DeJongh, J. I., San José, Costa Rica.	Jackson Company, Nashua, N. H.	Sargent, J. B., Leicester, Mass.
Adams, Dr. O. H., Vineland, N. J.	Dow, Roswell, Sycamore, Ill.	Jordan, Dr. M. D. L., Milan, Tenn.	Strong, S. B., Setauket, N. Y.
Abbott, Dr. E. K., Salinas, Cal.	Dinsmore, jr., Prof. T. H., Emporia, Kans.	Jones, Ira B., Neillsville, Wis.	Shriver, Howard, Wytheville, Va.
Arents, Hiram, Oroville, Cal.	Dudley, C. B., Altoona, Pa.	Jones, W. A., Blacksburg, Va.	Somerville, W. B., Birmingham, Ala.
Avey, O. H., Oskaloosa, Iowa.	Duton, Hosea, Woodstock, Vt.	Jones, F. M., Puerto de Luna, N. M.	Samostz, Oscar, Austin, Tex.
Adams, A. H., Fort Mead, Fla.	Dunlap, J. B., Charleston, Ill.	Kirkwood, E., Maury, Ind.	Shepard, E. M., Springfield, Mo.
Bisbee, Capt. Lewis, Buckfield, Me.	Dechant, Wm. H., Mahanoy Plane, Pa.	Knapp, J. G., Limona, Fla.	Smith, H. D., Monticello, Iowa.
Boerner, Prof. Chas. G., Vevay, Ind.	Eliason, W. A., Statesville, N. C.	Keese, G. Pomeroy, Cooperstown, N. Y.	Safford, A. T., Williamstown, Mass.
Ballou, Dr. N. E., Sandwick, Ill.	Eckstein, Rev. M., Conception, Mo.	Kuhne, F. W., Fort Wayne, Ind.	Sherman, W. B., Manchester, Iowa.
Boynton, John F., Syracuse, N. Y.	Ellis, John, Marquette, Nebr.	Keeler, W. F., Mayport, Fla.	Smith, Rev. D. W., Troy, Pa.
Bayerly, J. F., Spartanburg, S. C.	Ellsworth, W. W., Hartford, Conn.	King, W. R., Yellow Springs, Ohio.	Staudenmayer, Dr. L. R., Lincoln, N. C.
Bennett, Geo., London, Oreg.	Everett, Dr. J. T., Clyde, Ohio.	Lueps, Miss Anna, Manitowoc, Wis.	Snell, Miss S. C., Amherst, Mass.
Bell, Joseph, Franklin, Pa.	Ewell, Dr. M. D., South Evanston, Ill.	Lincoln, A. T., Marion, Va.	Sim, John R., Summit, Va.
Brainerd, Dr. H. G., Independence, Iowa.	Fernald, Prof. M. C., Orono, Me.	Loomis, J. C., Jeffersonville, Ind.	Spilman, J. J., Pierce City, Mo.
Baker, Dr. Henry B., Lansing, Mich.	Ferris, B. F., Sumner, Ind.	Lay, Dr. F. H., Pueblo, Colo.	Stone, W. E., Amherst, Mass.
Beall, Dr. R. L., Lenoir, N. C.	Flint, Dr. Earl, Rivas, Nicaragua.	Luther, S. M., Garrettsville, Ohio.	Swezey, Prof. G. D., Crete, Nebr.
Brendel, Dr. Fred., Peoria, Ill.	Fouch, Dr. A., College City, Cal.	Ladshaw, Geo. E., Paeolet, S. C.	Sacred Heart College, Prairie du Chien, Wis.
Bartlett, E. B., Vermillion, N. Y.	Fuller, E. N., Tacoma, Wash. T.	Lovewell, Prof. J. T., Topeka, Kans.	Trembley, Dr. J. B., Oakland, Cal.
Baldwin, A. L., Bethel, Conn.	Fox, G. W., Murrieta, Cal.	Lamb, Miss Bertha E., Sterling, Kans.	Todd, Prof. David P., Amherst, Mass.
Briggs, John, Albany, Oreg.	Friend, Chas. W., Carson City, Nev.	McPherson, Wm., Ross Valley, Cal.	Thornton, Prof. N. C., Geneseo, Ill.
Betts, Prof. Arthur, Webster, Dak.	Fleming, J., Readington, N. J.	McDonogh Institute, McDonogh, Md.	Tyrell, A. C., Madison, Nebr.
Breed, J. E., Embarras, Wis.	Field, Thos. G., Parkersburg, W. Va.	McCready, Miss L. A., Fort Madison, Iowa.	Truman, Geo. S., Genoa, Nebr.
Boyd, Joseph, Oskaloosa, Iowa.	Granville, J. J., East Saginaw, Mich.	Moore, C. R., Bird's Nest, Va.	Turnbo, Silas C., Pro Tem, Mo.
Beebe, A., Manistique, Mich.	Gates, W. B., Burlington, Vt.	Micklen, J. H., Variety Mills, Va.	Tillinghast, C. B., Albany, N. Y.
Boies, Lieut. A. H., Hudson, Mich.	Grathwohl, John, Blooming Grove, Pa.	McKenzie, Dr. M., Centerville, Mo.	Turner, Ernest, Point Pleasant, La.
Beans, T. J., Moorestown, N. J.	Gillingham, Milnor, Fallsington, Pa.	Memminger, E. R., Flat Rock, N. C.	Thompson, R. J., Tiffin, Ohio.
Barney, W., Stowe, Vt.	Gardiner, R. H., Gardiner, Me.	Mallory, Miss H. B., Corpus Christi, Tex.	Voegeli, Adolphus, Des Moines, Iowa.
Bryant, A. F., Yutan, Nebr.	Gowey, H. D., North Lewisburg, Ohio.	Macrae, Colin, Kirkwood, S. C.	Washburne Observatory, Madison, Wis.
Beecher, Chas., Wysox, Pa.	Gibson, John H., Salina, Kans.	Meehan, Thos., Germantown, Pa.	Wild, Rev. E. P., Newport, Vt.
Charbonnier, Prof. L. H., Athens, Ga.	Green, Dr. Jesse C., West Chester, Pa.	Moore, Nathan, Grampian Hills, Pa.	Williams, Rev. C. F., Ashwood, Tenn.
Cook, S. A., Milledgeville, Ga.	Gerrish, S. H., Sacramento, Cal.	Mikesell, Thos., Wauseon, Ohio.	Wing, Miss M. E., Charlotte, Vt.
Cotton, Dr. D. B., Portsmouth, Ohio.	Gray, J. W., Stockham, Nebr.	McClintock, F., West Union, Iowa.	West, Silas, Cornish, Me.
Clark, A. C., Wausau, Wis.	Goodwin, Wm., North Colebrook, Conn.	Marshall, G., Cresco, Iowa.	Wylie, Wm., Mount Forest, Canada.
Casey, Geo., Auburn, N. Y.	Gray, F. R., Yates Centre, Kans.	Mitchell, Dr. D. W., Harrisville, Mich.	Walton, J. P., Muscatine, Iowa.
Crawford, E. A., Liberty Hill, La.	Gillingham, W., Acetotink, Va.	Miller, H. D., Drifton, Pa.	Walt, S. E., Traverse City, Mich.
Curtiss, G. G., Fallston, Md.	Garlick, Rev. Dr. J. R., Brimington, Va.	Moore, Dr. J. W., Easton, Pa.	Woodstock College, Woodstock, Md.
Cornell University, Ithaca, N. Y.	Gray, Capt. A. W., Kenewick, Wash. T.	Neal, Dr. J. C., Archer, Fla.	Wolfe, John H., Wellington, Kans.
Cutting, Dr. Hiram A., Lunenburg, Vt.	Heath, E. R., Wyandotte, Kans.	Newbegin, John D., Anna, Ill.	West, Dr. Jos. O., Princeton, Mass.
Carmody, Prof. C. M., Emmitsburg, Md.	Horn, Dr. H. B., Atchison, Kans.	Newcomb, G. S., Westborough, Mass.	Washington Receiving Reservoir, D. C.
Crosier, Adam, Laconia, Ind.	Hiram College, Hiram, Ohio.	Noll, A. B., Somerville, N. J.	Aqueduct Distributing " "
Caulkins, John S., Thornville, Mich.	Harvard College Observatory, Cambridge, Mass.	Nordberg, A., Richardson, Dak.	Great Falls Reservoir, Md.
Clark, T. A., Weldon, N. C.	Hammit, John W., College Hill, Ohio.	Nourse, H. D., Washington, D. C.	Rock Creek Bridge, D. C.
Chandler, Dr. W. J., South Orange, N. J.	Heaton, Isaac E., Fremont, Nebr.	Norcom, Prof. T. J., Reldsville, N. C.	Weir's Bridge, N. H.
Cass, John J., Allison, Kans.	Helm, Thos. B., Logansport, Ind.	Osborn, Dr. Thos. C., Cleburne, Tex.	Winipiseogee Lake Cotton and Woolen Manufacturing Co.
Coneh, E. D., Contoocook, N. H.	Hoskinson, R. M., Bainbridge Island, Wash. Ter.	Olds, H. D., Cedar Rapids, Iowa.	Woodstock, N. H.
Carleton College, Prof. W. W. Payne, director, Northfield, Minn.	Hyde, G. A., Cleveland, Ohio.	Owsley, Dr. J. B., Jacksonborough, O.	Wolfborough, N. H.
Cleveland, Dr. G. H., Pentwater, Mich.	Hunter, Dr. T. C., Napoleon, Ohio.	Otis, H. G., Washington, Pa.	Lake Village, N. H.
Carpenter, Dr. W. B., Leavenworth, K.	Haywood, John, Westerville, Ohio.	Phillips, W. R., Evansville, Wis.	Bristol, N. H.
Christ, Jacob, Franklin, Wis.	Hassler, B. K., Chambersburg, Pa.	Parker, D., Humboldt, Iowa.	Belmont, N. H.
Carpenter, Prof. L. G., Lansing, Mich.	Hartzler, J. A., Mottville, Mich.	Pearce, Thomas, Eola, Oreg.	Ashland, N. H.
Cheney, Wm., Minneapolis, Minn.	Hall, J. B., Worcester, Mass.	Porterfield, L. C., Tidioute, Pa.	Willis, O. R., A. M., Ph. D., White Plains, N. Y.
Cooke, A. R., Indianola, Iowa.	Hager, Mrs. L. G., Terre Haute, Ind.	Partrick, J. M., North Volney, N. Y.	Watters, Dr. Jas., Westmoreland, Kan.
Culver, G. E., Vermillion, Dak.	Howe, Prof. J. L., Richmond, Ky.	Purdue University, La Fayette, Ind.	Went, E. C., Frankfort, Ky.
Carter, Rev. Dr. W. H., Tallahassee, Fla.	Hoyt, F. C., Easton, Pa.	Pettersen, Dr. F., Comfort, Tex.	Williams, Dr. A. C., Elk Falls, Kans.
Comstock, Prof. F. M., Le Roy, N. Y.	Houghton Farm Experiment Station, Mountainville, N. Y.	Remington, C. V. S., Fall River, Mass.	Wiggs, Dr. Geo., East Portland, Oreg.
Calhoun, P. B., Austin, Tenn.	Heatwole, L. J., Dale Enterprise, Va.	Robertson, T. D., Rockford, Ill.	Wetmore, E. L., Tucson, Ariz.
Chaffee, W. K., Carthage, Mo.	Harper, Geo. W., Cincinnati, Ohio.	Rogers, F. M., Luling, La.	Wright, J. W. A., Greensborough, Ala.
Collin, Prof. A., Mount Vernon, Iowa.	Hazen, Rev. A., Deerfield, Mass.	Rotch, A. L., Blue Hill, Mass.	Whitmore, J. E., Gallinas Spring, N. Mex.
Cummings, L. D., Palmyra, N. Y.	Hamilton, W. H., Corsicana, Texas.	Russell, Geo. W., Wellsburg, W. Va.	Walters, H. H., Christianburg, Va.
Cooper, Dr. Geo. C., Manatee, Fla.	Hatch, A. H., Windsor, Ill.	Runge, C., New Ulm, Tex.	Wistrom, M. F., Harvard, Nebr.
Corbin, F. E., Dudley, Mass.	Harris, W. C., Dover, N. J.	Richardson, C. F., Beverly, N. J.	Wadsworth, Dr. J. L. R., Collinsville, Ill.
Chubbs, Thos. H., Post Mills, Vt.	Hickman, E. A., Independence, Mo.	Starr, Prof. F. Cedar Rapids, Iowa.	Widman, Rev. C. M., Grand Coteau, La.
Cole, Seward, Caluenga, Cal.	Hodge, Rev. F. B., Wilkesbarre, Pa.	Shaw, E., Nineseah, Kan.	Williams, Dr. A. C., Elk Falls, Kans.
Cutler, B. B., Heath, Mass.	Houskeeper, H. S., S. Bethlehem, Pa.	Strong, W. C., Kents Hill, Me.	Watson, Evan, Fort Scott, Kans.
Chapin, Adams, Poway, Cal.	Humphrey, Dr. L., Fairbury, Nebr.	Snow, Prof. F. N., Lawrence, Kan.	White, Rev. J. H., Merritt's Island, Fla.
Childs, W. H., Brattleborough, Vt.	Heron, Dr. C. J., Paramaribo, Dutch Guiana, S. A.	Sanders, T. B., Susanville, Cal.	Ward, J. B., Guilford, Ind.
Davis, Jacob, Rowe, Mass.	Hancock, J. L., Quakerstown, Pa.	Simmons, Prof. W. G., Wake Forest, N. C.	Whitney, Chas. E., Humphrey, N. Y.
Dickinson, Jas. B., Guttenberg, Iowa.	Harris, T. C., Raleigh, N. C.	Shriver, E. T., Cumberland, Md.	Whittington, G., Mount Ida, Ark.
Deming, H. D., Wellsborough, Pa.	Hurlin, Rev. Wm., Antrim, N. H.	Seltz, Chas., De Soto, Nebr.	Yetter, Wm. G., Catawissa, Pa.
Dozier, Wm., Mattoon, Ill.		Scott, Thos. G., Forsyth, Ga.	Yates, T. P., Factoryville, N. Y.
Dewhurst, Rev. E., Voluntown, Conn.		Stucky, Dr. C. T., Helvetia, W. Va.	Young, Geo. R., Penn Yan, N. Y.
Dunlap, W. L., Tecumseh, Nebr.		Stern, Jacob T., Logan, Iowa.	Zimmerman, F. C., Bunker Hill, Ill.
Day, Theodore, Dyberry, Pa.		Slade, Elissa, Somerset, Mass.	
Dawson, Wm., Spiceland, Ind.			

Military posts from which meteorological reports were received, through the Surgeon General of the Army, in time to be used in the preparation of the Monthly Weather Review for October, 1885.

Alcatraz Island, Cal.	Concho, Fort, Tex.	Lewis, Fort, Colo.	McHenry, Fort, Md.	Randall, Fort, Dak.	Shaw, Fort, Mont.
Angel Island, Cal.	Columbus, Fort, N. Y.	Lyons, Fort, Colo.	Mount Vernon Bks, Ala.	Reno, Fort, Ind. Ter.	Totten, Fort, Dak.
Assinaboine, Fort, Mont.	David's Island, N. Y. H.	Mason, Fort, Cal.	Meade, Fort, Dak.	Robinson, Fort, Nebr.	Townsend, Fort, Wash. T.
A. Lincoln, Fort, Dak.	Ellis, Fort, Mont.	Madison Barracks, N. Y.	Niagara, Fort, N. Y. [Cal.	Snelling, Fort, Minn.	Union, Fort, N. Mex.
Benicia Barracks, Cal.	Fred Steele, Fort, Wyo.	McDermitt, Fort, Nev.	Presidio of San Francisco.	Saint Augustine, Fla.	Wingate, Fort, N. Mex.
Bidwell, Fort, Cal.	Gaston, Fort, Cal.	Monroe, Fort, Va.	Plattsburg Barracks, N. Y.	Sully, Fort, Dak.	West Point, N. Y.
Brady, Fort, Mich.	Klamath, Fort, Oreg.	Majave, Fort, Ariz.	Pembina, Fort, Dak.	Sisseton, Fort, Dak.	Yates, Fort, Dak.
Brown, Fort, Tex.	Keogh, Fort, Mont.	McDowell, Fort, Ariz.	Premble, Fort, Me.		

State weather services from which meteorological reports were received in time to be used in the preparation of the Monthly Weather Review for October, 1885.

Alabama State Weather Service, under direction of Prof. P. H. Mell, jr., Auburn, Alabama.
 Georgia State Weather Service, under direction of Hon. J. T. Henderson, Atlanta, Georgia.
 Indiana State Weather Service, under direction of Prof. H. A. Huston, La Fayette, Indiana.
 Indiana State Weather Service, under direction of Prof. W. H. Ragan, DePauw University, Greencastle, Indiana.
 Minnesota State Weather Service, under direction of Prof. W. W. Payne, Northfield, Minnesota.
 Missouri State Weather Service, under direction of Prof. Francis E. Nipher, Saint Louis, Missouri.
 Nebraska Weather Service, under direction of Prof. Goodwin D. Swezey, Crete, Nebraska.
 New England Meteorological Society, Prof. Winslow Upton of Providence, R. I., President; Prof. W. M. Davis, of Cambridge, Mass., Secretary.
 Ohio State Weather Service, under direction of Prof. B. F. Thomas, of the Ohio State University, Columbus, Ohio.
 Tennessee State Weather Service, under direction of Mayor H. C. Bate, Nashville, Tennessee.
 Data have also been used from meteorological records of the Central Pacific and Southern Pacific railway companies.

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